INSTRUCTION MANUAL

EMR MODEL 516
DEMULTIPLEXER
(REVISION A)
(SERIAL NO. 6 AND UP)

EMR

EMR
Schlumberger

MP MASTER
MA20090

INSTRUCTION MANUAL

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EMR
Schlumberger

EMR TELEMETRY
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November, 1970

MANUAL CHANGE NOTICE #1

EFFECTIVITY: EMR Model 516 Demultiplexer, Serial Numbers 5 and Up.

CHANGE: To reduce noise on the word counter clock and reset signals, the following capacitors have been added:

Capacitor	From	To
A3C1	A3J6-11	A3J6-27
A3C2	A3J6-12	A3J6-28
A4C1	A4J9-2	A4J9-4
A4C2	A4J9-2	A4J9-5

The part descriptions for the added components are as follows:

A3C1 and A3C2 -- CAPACITOR, 560 Pf ±1%, 300V;
EMR PART NO. 304-41-56009;
SPEC; 600.

A4C1 and A4C2 -- CAPACITOR, 150 Pf ±1%, 500V;
EMR PART NO. 304-20-15009;
SPEC; 600.

LIST OF EFFECTIVE PAGES

Dates of issue for basic and revision are:

Basic . . . . . March 1970
Revision A . . . . . March 1971

Total number of pages in this manual is 109 consisting of the following:

Page No.	Rev. Letter	Page No.	Rev. Letter
*Title	A	*4-9 thru 4-14	A
*i thru iv	A	5-1 thru 5-4	Basic
1-1 thru 1-4	Basic	*5-5 thru 5-9	A
*1-5	A	5-10	Basic
1-6	Basic	*5-11	A
2-1	Basic	5-12 thru 5-16	Basic
*2-2	A	*5-17	A
2-3	Basic	5-18	Basic
*2-4	A	*5-19	A
*3-1	A	5-20 thru 5-22	Basic
3-2	Basic	*5-23	A
*3-3	A	5-24 thru 5-27	Basic
3-4 and 3-5	Basic	*5-28	A
*4-1	A	5-29 thru 5-36	Basic
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SECTION 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

This instruction manual contains information describing the operation and maintenance of the EMR Model 516 Demultiplexer. Included in this manual are physical and functional descriptions, specifications, installation and operating instructions, theory of operation, maintenance information, and parts lists.

The Model 516 Demultiplexer is a complete unit which accepts parallel input, 10-bit binary weighted data words (channels) in formats of from 1 to 128 channels per frame plus channel rate and frame rate timing pulses from an EMR Model 515 PAM Synchronizer or similar device. A Model 516 is capable of providing up to 32 decommutated analog outputs from a 128-channel format. The Model 516 was developed primarily for use with the Model 515 to form a PAM decommutation system for quick-look and checkout applications where ease of operation by manual setup, small size, and ruggedness are primary requirements. Figure 1-1 illustrates a typical system configuration using four Model 516 Demultiplexers capable of decommutating 128 analog data outputs. As shown on Figure 1-1, a Model 516 also provides buffered outputs of the binary multiplex and timing pulses which are suitable for driving additional 516's or other compatible devices such as the EMR 2700 Series of products.

1.2 FUNCTIONAL DESCRIPTION

The Model 516 Demultiplexer, Figure 1-2, receives parallel, 10-bit binary multiplex channel inputs in an input format of from 1 to 128 channels per frame from an EMR Model 515 PAM Synchronizer or similar device. The Model 516 also receives channel rate and frame rate timing pulses from the associated input device. The channel rate and frame rate timing pulses are buffered and applied to a channels counter which regenerates the channel identification of the input source devices. Sequential channel count pulses are applied to the DAC programming circuits. By means of pin board programming, any valid channel count may be routed to any of the digital-to-analog converter circuits contained in the Model 516. The 10-bit binary multiplex input is also buffered by the Model 516 and the eight most significant bits for each input channel are applied simultaneously to each DAC circuit. A specific channel count pulse routed to a selected DAC by means of the programming board causes the associated binary data to be stored by the DAC. The stored data are converted to analog and provided as an output for external monitoring devices. The Model 516 can provide from 4 to 32 (in groups of four) analog outputs, depending upon the DAC complement of the unit. The buffered binary multiplex and timing pulses are also provided as outputs for driving another 516 or device accepting similar input signals.

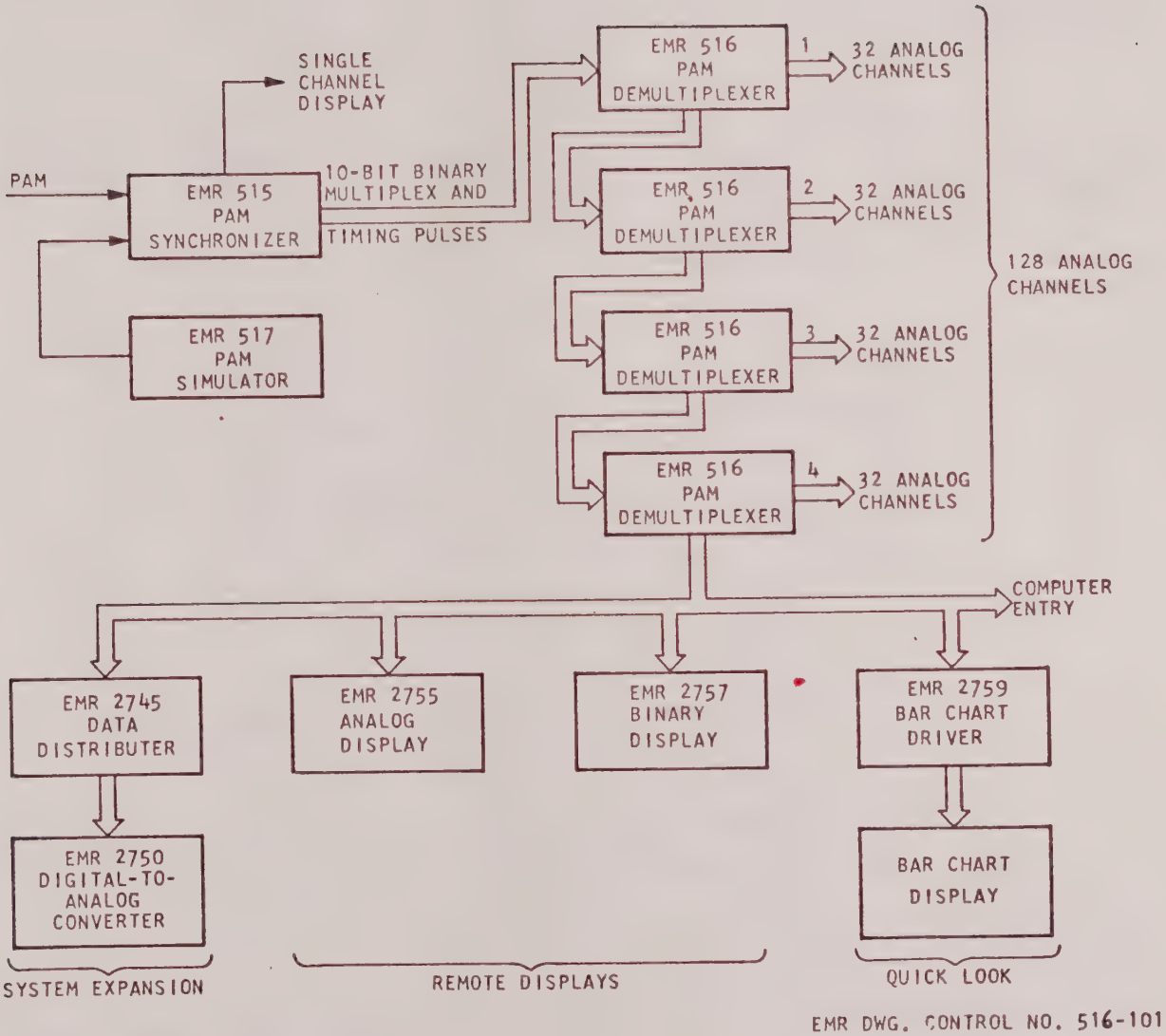


Figure 1-1. Typical System Application

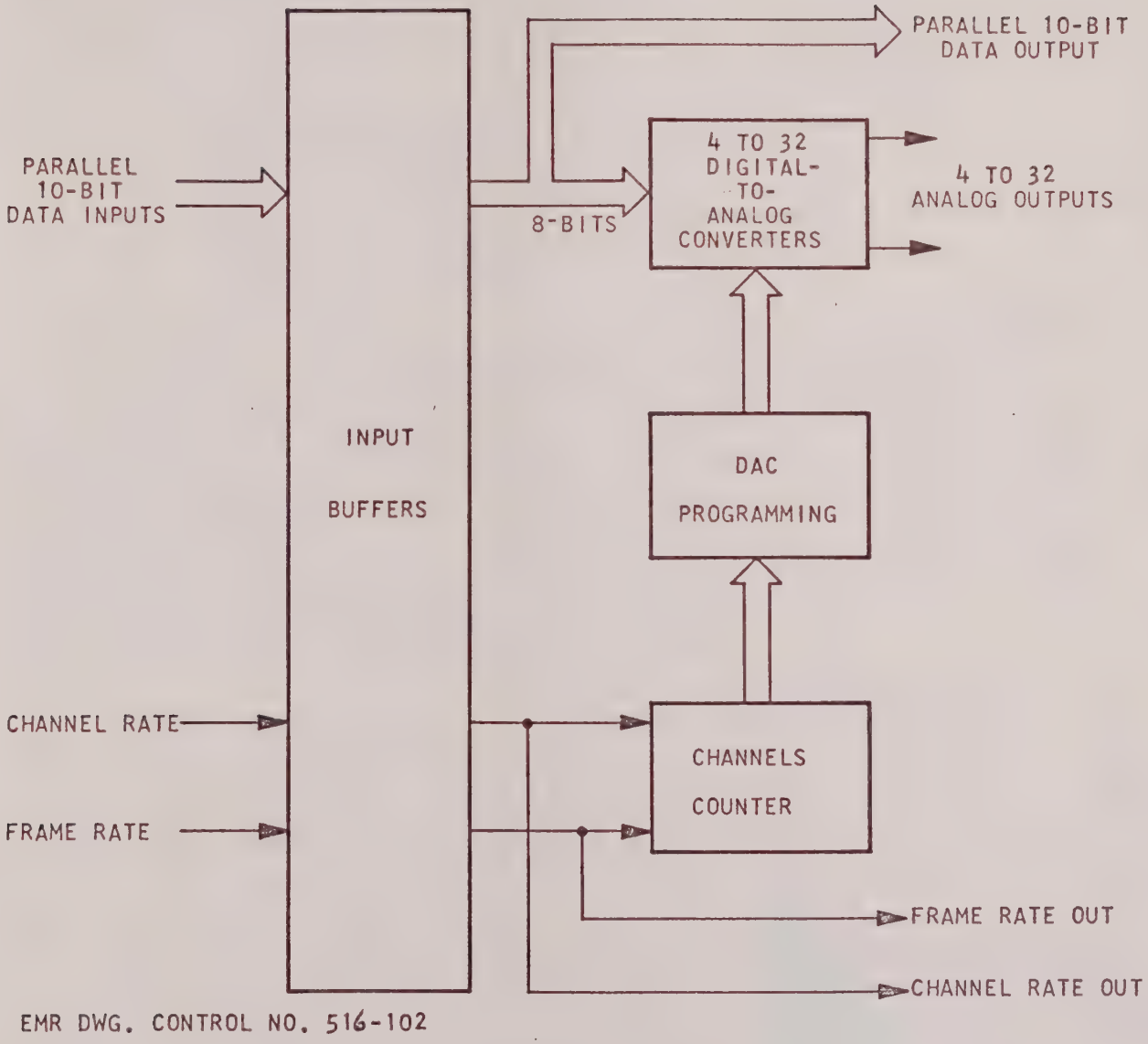


Figure 1-2. Model 516 Demultiplexer, Simplified Block Diagram

1.3 PHYSICAL DESCRIPTION

The Model 516 is a precision built, solid-state instrument designed for mounting in a standard 19-inch EIA-type equipment rack. The overall dimensions of this unit are 3-1/2 inches high, 19 inches wide, and 15 inches deep. The Model 516 weighs approximately 25 pounds excluding the slides.

NOTE

For convenience in presenting wiring information, arbitrary reference designations have been assigned to the main chassis (A1), front panel (A2), rear panel (A3), and the DAC Programmer Assembly (A4). The complete assembly diagram for the Model 516 is shown in Figure 5-1.

The main chassis contains the plug-in printed wiring board complement for the specific configuration of the Model 516, plus an interconnection board. The printed wiring board complement consists of a logic card, a regulator card and from one to eight digital-to-analog converter cards, each containing four individual DAC circuits. Table 1-1 identifies the individual printed-wiring board types and Figure 1-3 identifies the card locations. Access to the printed-wiring boards and other internal circuitry of the Model 516 is by means of a removable cover on the top of the unit. In addition to the printed-wiring boards, the main chassis is also the location for an internal power supply which provides source voltages for the Model 515 regulator circuits.

The front panel, A2, contains the single operating control (POWER indicator/switch A2DS1/S1) for the Model 516. The front panel also provides the mounting location for the plug-in DAC Programmer Assembly A4. Plug-in assembly A4 is composed of a printed-wiring board assembly and a pin board mounted in a chassis 2-5/8 inches high, 6-7/8 inches wide and 12-5/8 inches deep. The DAC Programmer is interconnected with the main chassis by means of a rear plug, A4P1, which mates with internal connector A1J9. Assembly A4 is secured to the front panel of the Model 516 with a twist-to-lock fastener. Programming of the pin board is accomplished using diode plugs provided with the pin board. Two diode plugs are provided for each DAC of the ordered configuration. For example, if a Model 516-01-X-32 (32 DAC's) were ordered, 64 diode plugs would be furnished. Additional diode plugs may be ordered if strapping of input data channels is desired. Complete programming information is provided in Section 3 of this manual. An option which may be obtained for the Model 516 is pre-programming panels. These panels are provided in pairs with threaded diode plugs. Each of the removable pre-programming panels plugs directly into one-half of the DAC Programmer pin board and facilitates rapid change-over from one input channel vs. DAC program to another. Refer to Figure 2-1 for ordering information.

Table 1-1. Model 516 Printed-Wiring Boards

CARD NO.	ASSY. NO.	NAME
1	19380	Logic Board Printed-Wiring Assembly
2 Thru 9 (As Required)	* 19377 or 19377-1	Digital-to-Analog Printed-Wiring Assembly
10	19383	Regulator Printed-Wiring Board

* ±5-volt output units use the 19377 card configuration. 0-volt to +10-volt output units use the 19377-1 card configuration.

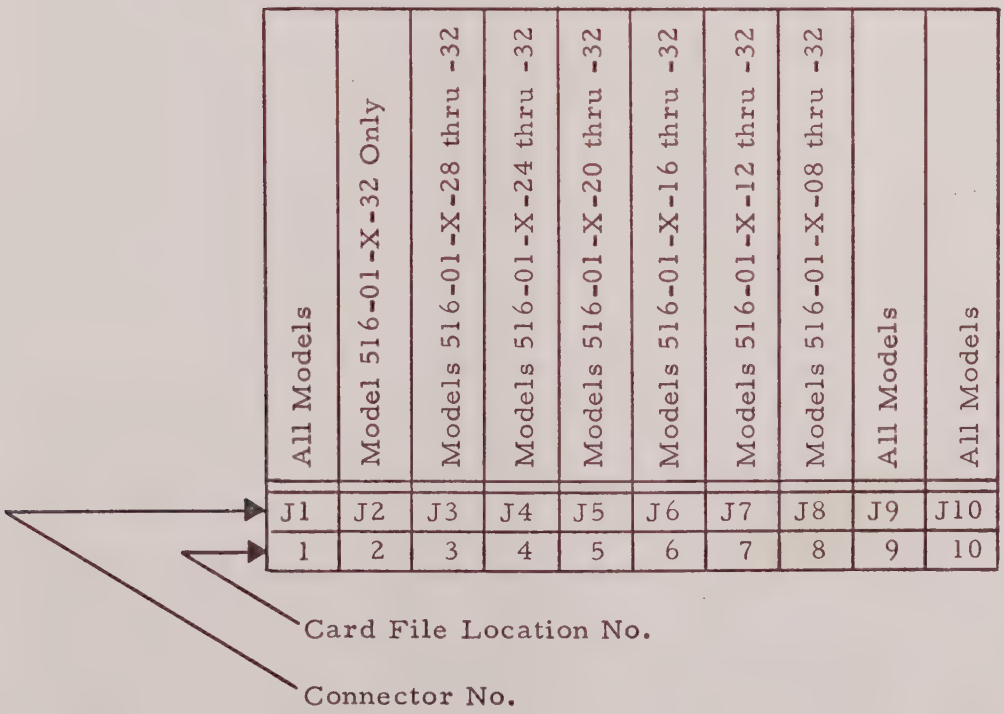


Figure 1-3. Model 516 Printed-Wiring Board Locations (See Table 1-1)

All input and output signal and power distribution for the Model 516 is accomplished through connectors on the rear panel, A3. Individual connector locations and functions are identified in Section 3. The rear panel also provides the mounting location for blower assembly A3B1 which provides forced air cooling for the internal circuitry.

SECTION 2

SPECIFICATIONS

2.1 GENERAL

This section outlines the electrical and mechanical specifications for the EMR Model 516 Demultiplexer Assembly.

2.2 ELECTRICAL SPECIFICATIONS

2.2.1 Input Requirements

a. Signal Characteristics

1. Logic Levels: ZERO -- 0V to +0.45V DC; ONE -- +3V to +5V DC (+5.5V absolute maximum input voltage).

2. Input Current: Each logic ZERO input must sink at least 1.66 ma at 0V. Each logic ONE input must supply at least 0.1 ma at +3V.

3. Noise Immunity: The inputs will recognize voltage levels between 0V and +1.1V as logic ZEROs and levels from +1.9V to +5V as logic ONEs thereby providing a noise immunity of 0.65V for logic ZERO and 0.60V for logic ONE. (When the input equals 1.1V the output may be 2.5V.)

4. Input Loading: When driven from SUHL I logic elements the inputs load the driving circuit by one logic load.

b. Data Input: Ten bit parallel binary data.

c. Frame Length: One to 128 channels per frame.

d. Operating Frequency: Accepts channel rates up to 100,000 channels per second.

e. Channel Rate Pulse: A positive-going pulse with a minimum width of 500 nanoseconds occurring once per channel while the data bits are stable.

f. Frame Rate Pulse: A positive-going pulse with a minimum width of 500 nanoseconds occurring once per frame. This pulse is terminated a minimum of 100 nanoseconds prior to the channel rate pulse for channel 1.

2.2.2 Output Signal Characteristics

a. Output Channels (See Figure 2-1): Up to 32 DAC outputs may be provided. Each DAC card provides four DAC circuits with a maximum DAC card complement of eight. Data from any channel of the input format (1 to 128 channels per frame) may be routed to any DAC circuit by means of diode plug programming and any number of channels can be strapped (super-commutated) to any selected DAC. Strapping does not reduce the number of available DAC outputs.

b. Output Impedance: Not more than 5 ohms.

c. Amplitude (See Figure 2-1): −5 volts to +5 volts for 516-01-X-XX-1; 0 volt to +10 volts for 516-01-X-XX-0.

d. Rise and Settling Time: Settling to within ±0.25% of final value in not more than 60 microseconds.

e. Load Impedance: 1000 ohms minimum. The output is indefinitely short-circuit protected.

f. Capacitive Load: Will drive 1000 picofarads with no oscillations.

g. Accuracy: Better than ±0.5% of full scale.

h. Linearity: Better than ±0.2% of full scale for all channel rates. Typically better than ±0.1% of full scale.

2.3 POWER REQUIREMENTS

2.3.1 Input Voltage (See Figure 2-1)

a. Model 516-01-0: 105V to 130V rms at 47 to 65 Hz.

b. Model 516-01-8: 210V to 260V rms at 47 to 65 Hz.

f. Frame Rate Pulse: A positive-going pulse with a minimum width of 500 nanoseconds occurring once per frame. This pulse is terminated a minimum of 100 nanoseconds prior to the channel rate pulse for channel 1.

2.2.2 Output Signal Characteristics

a. Output Channels (See Figure 2-1): Up to 32 DAC outputs may be provided. Each DAC card provides four DAC circuits with a maximum DAC card complement of eight. Data from any channel of the input format (1 to 128 channels per frame) may be routed to any DAC circuit by means of diode plug programming and any number of channels can be strapped (super-commutated) to any selected DAC. Strapping does not reduce the number of available DAC outputs.

b. Output Impedance: Not more than 5 ohms.

c. Amplitude (See Figure 2-1): −5 volts to +5 volts for 516-01-X-XX-1; 0 volt to +10 volts for 516-01-X-XX-0.

d. Rise and Settling Time: Settling to within ±0.25% of final value in not more than 60 microseconds.

e. Load Impedance: 1000 ohms minimum. The output is indefinitely short-circuit protected.

f. Capacitive Load: Will drive 1000 picofarads with no oscillations.

g. Accuracy: Better than ±0.5% of full scale.

h. Linearity: Better than ±0.2% of full scale for all channel rates. Typically better than ±0.1% of full scale.

2.3 POWER REQUIREMENTS

2.3.1 Input Voltage (See Figure 2-1)

a. Model 516-01-0: 105V to 130V rms at 47 to 65 Hz.

b. Model 516-01-8: 210V to 260V rms at 47 to 65 Hz.

2.3.2 Input Power

Not more than 85 watts.

2.4 MECHANICAL SPECIFICATIONS

a. Height: 3-1/2 inches

b. Width: 19 inches

c. Depth: 15 inches

d. Weight: Approximately 25 pounds (excluding slides)

e. Mounting: See Figure 2-1

f. Paint Finish: See Figure 2-1

2.5 ENVIRONMENTAL SPECIFICATIONS

a. Operating Temperature: 0°C to +50°C

b. Storage Temperature: −40°C to +80°C

c. Relative Humidity: Up to 95%

d. Cooling: Internal forced-fan cooling is provided with air input through rear of unit. Air exhaust is provided to assure maximum convection.

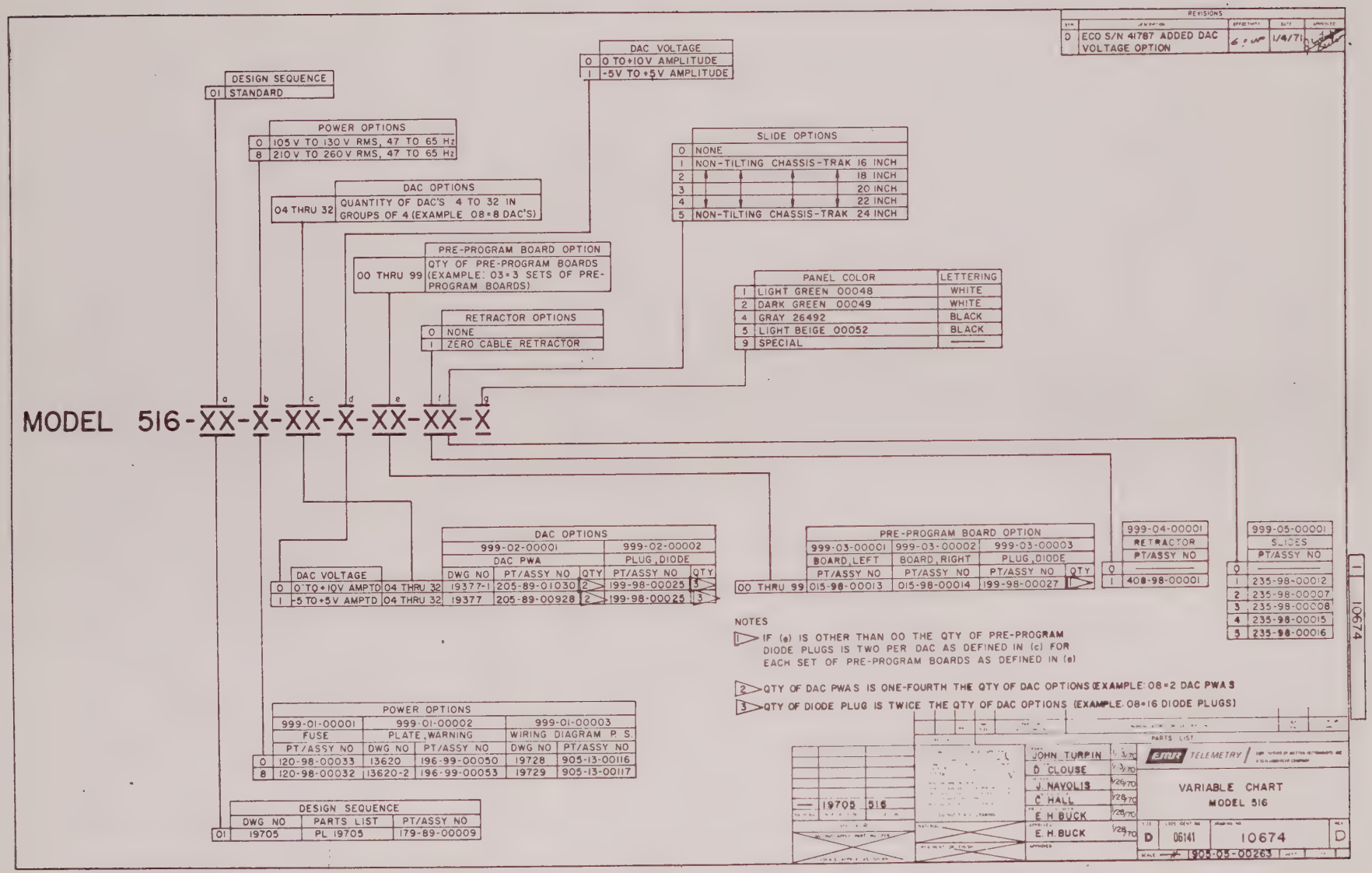

REVISIONS
D ECO S/N 41787 ADDED DAC VOLTAGE OPTION 1/4/71
DESIGN SEQUENCE
01 STANDARD
DAC VOLTAGE
0 0 TO +10V AMPLITUDE
1 -5V TO +5V AMPLITUDE
POWER OPTIONS
0 105 V TO 130 V RMS, 47 TO 65 Hz
8 210 V TO 260 V RMS, 47 TO 65 Hz
DAC OPTIONS
04 THRU 32 QUANTITY OF DAC'S 4 TO 32 IN GROUPS OF 4 (EXAMPLE 08=8 DAC'S)
SLIDE OPTIONS
0 NONE
1 NON-TILTING CHASSIS-TRAK 16 INCH
2 18 INCH
3 20 INCH
4 22 INCH
5 NON-TILTING CHASSIS-TRAK 24 INCH
PRE-PROGRAM BOARD OPTION
00 THRU 99 QTY OF PRE-PROGRAM BOARDS (EXAMPLE: 03=3 SETS OF PRE-PROGRAM BOARDS)
PANEL COLOR
1 LIGHT GREEN 00048 WHITE
2 DARK GREEN 00049 WHITE
4 GRAY 26492 BLACK
5 LIGHT BEIGE 00052 BLACK
9 SPECIAL
LETTERING
RETRACTOR OPTIONS
0 NONE
1 ZERO CABLE RETRACTOR
MODEL 516-XX-X-XX-X-XX-XX-X
a b c d e f g
DAC VOLTAGE
0 0 TO +10V AMPTD 04 THRU 32 19377-1 205-89-01030 2 199-98-00025 3
1 -5 TO +5V AMPTD 04 THRU 32 19377 205-89-00928 2 199-98-00025 3
DAC OPTIONS
999-02-00001 DAC PWA DWG NO PT/ASSY NO QTY
999-02-00002 PLUG, DIODE PT/ASSY NO QTY
PRE-PROGRAM BOARD OPTION
999-03-00001 BOARD, LEFT PT/ASSY NO
999-03-00002 BOARD, RIGHT PT/ASSY NO
999-03-00003 PLUG, DIODE PT/ASSY NO QTY
00 THRU 99 015-98-00013 015-98-00014 199-98-00027 1
999-04-00001 RETRACTOR PT/ASSY NO
0 —
1 408-98-00001
999-05-00001 SLIDES PT/ASSY NO
0 —
1 235-98-00012
2 235-98-00007
3 235-98-00008
4 235-98-00015
5 235-98-00016
NOTES
1 IF (a) IS OTHER THAN 00 THE QTY OF PRE-PROGRAM DIODE PLUGS IS TWO PER DAC AS DEFINED IN (c) FOR EACH SET OF PRE-PROGRAM BOARDS AS DEFINED IN (e)
2 QTY OF DAC PWAS IS ONE-FOURTH THE QTY OF DAC OPTIONS (EXAMPLE: 08=2 DAC PWAS
3 QTY OF DIODE PLUG IS TWICE THE QTY OF DAC OPTIONS (EXAMPLE: 08=16 DIODE PLUGS)
POWER OPTIONS
999-01-00001 FUSE PT/ASSY NO DWG NO PT/ASSY NO
999-01-00002 PLATE, WARNING DWG NO PT/ASSY NO
999-01-00003 WIRING DIAGRAM P. S. DWG NO PT/ASSY NO
0 120-98-00033 13620 196-99-00050 19728 905-13-00116
8 120-98-00032 13620-2 196-99-00053 19729 905-13-00117
DESIGN SEQUENCE
01 DWG NO 19705 PARTS LIST PL 19705 PT/ASSY NO 179-89-00009
PARTS LIST
19705 516
JOHN TURPIN 1/3/70
D CLOUSE 1/3/70
J NAVOLIS 1/26/70
C HALL 1/28/70
E H BUCK 1/28/70
E. H. BUCK 1/28/70
EMR TELEMETRY
VARIABLE CHART
MODEL 516
D 06141 10674 D
SCALE NONE 905-05-00263
10674

Figure 2-1. Model 516 Demultiplexer Variable Data

SECTION 3

INSTALLATION AND OPERATION

3.1 INSTALLATION

The EMR Model 516 Demultiplexer is shipped completely assembled and ready for installation. The unit is calibrated and adjusted prior to shipment and all plug-in printed-wiring cards inserted into the appropriate receptacles and all covers installed. The unit should be inspected immediately on its arrival and notice given to EMR-Telemetry of any claim that the product does not conform with the terms of the order.

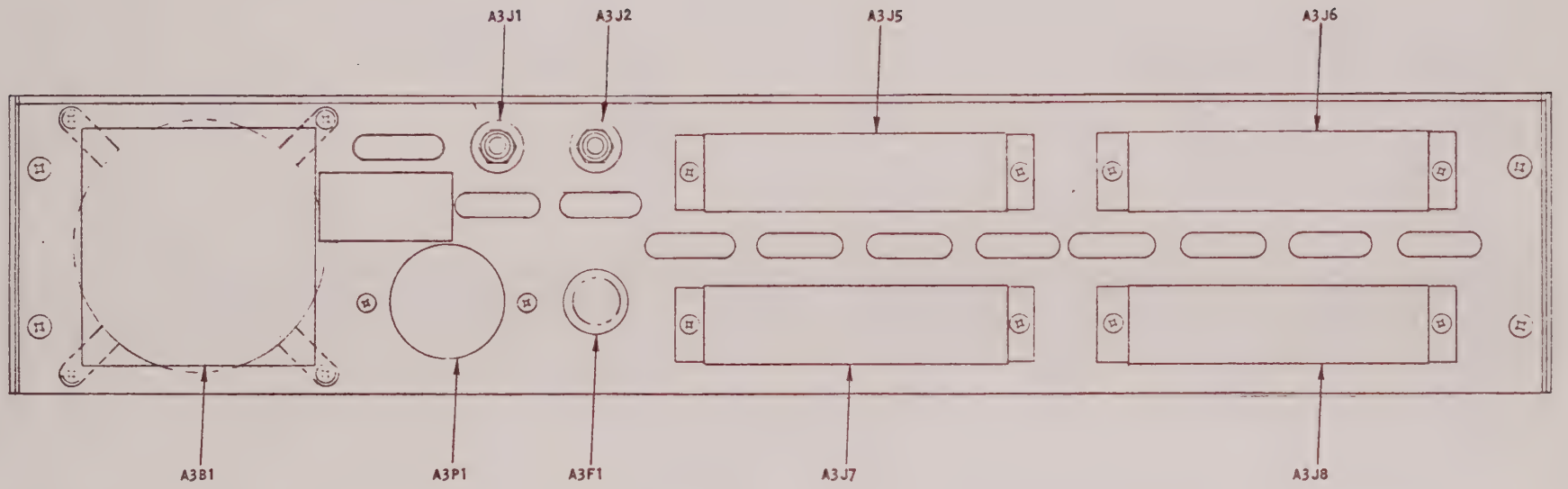
The Model 516 may be ordered with or without mounting slides. Units ordered without slide mounts may be bolted directly to a standard 19-inch, EIA-type equipment rack with the hardware provided for that purpose. For installation of a Model 516 with slide mounts, remove the slides from the demultiplexer after unpacking the unit and mount the slides to the internal frame of the equipment rack. Mounting hardware for this installation is supplied with the demultiplexer. Insert the demultiplexer into the slides until the unit is firmly seated. Turn-to-lock fasteners are located on either side of the front panel to secure the unit in the rack.

The Model 516 may be extended from the equipment rack for servicing by loosening the front panel turn-to-lock fasteners and pulling the unit straight out. Pushbutton stop latches, located on the outside surfaces of both slides, hold the unit at the maximum extension. At this point, the Model 516 may be removed fron the rack by depressing the pushbutton stop latches and pulling the unit straight out.

The external electrical connections to the Model 516 are terminated at connectors on the rear panel. These connectors and other rear-panel components are illustrated in Figure 3-1 and described in Table 3-1.

3.2 OPERATION

Operator control of the Model 516 is limited to application or removal of power from the unit by means of the front panel POWER indicator-switch and manual programming the DAC Programmer assembly for the desired input data channel versus digital-to-analog converter circuit association. As described previously, the input format to the Model 516 may be composed of from one to 128 channels per frame and the Model 516 may contain from 4 to 32 DAC circuits, in increments of 4, depending upon the specific unit configuration (See Figure 2-1). Any channel of the input format may be routed to any DAC circuit in the unit by patching. Strapping is accomplished by patching two or more channels to a



DRAWING CONTROL NO. 516-301

Figure 3-1. Model 516 Rear Panel Connectors and Components

Table 3-1. Function of Rear Panel Connectors and Components (See Figure 3-1)

DESIG.	TYPE	FUNCTION
A3B1	Blower	System cooling.
A3F1	See Figure 2-1	Primary power overload protection.
A3J1	Binding Post	Signal ground connection.
A3J2	Binding Post	Chassis ground connection.
A3J5	32-Pin	Output connector for analog outputs 17 through 32.
A3J6	32-Pin	Input connector for 10-bit binary multiplex, channel rate pulse, and frame rate pulse.
A3J7	32-Pin	Output connector for analog outputs 1 through 16.
A3J8	32-Pin	Output connector for buffered 10-bit binary multiplex, channel rate pulse, and frame rate pulse.
A3P1	Hubbell Twist-Lock	Primary power input connector.

common DAC. The DAC Programmer matrix board, Figure 3-2, is a 64 x 28 pin board wired to electrically represent a 128 x 14 unit. The left half of the board is associated with input channels 1 through 64 and the right half of the board is associated with channels 65 through 128. Fourteen holes (TENS 0 through 3 and UNITS 0 through 9) are associated with each channel number. To route a specific channel to a specific DAC, two of the diode plugs provided with the DAC Programmer assembly are used, one to program the appropriate TENS digit and one to program the UNITS. For example, to route channel 13 to DAC 4 a diode plug is inserted in the TENS = 0 hole for channel 13 and a second plug is inserted in the UNITS = 4 hole. All channel vs. DAC selections are programmed in the same manner.

Removable, pre-programmable boards of panels are available on special order for the Model 516. The pre-programmable boards are provided in pairs with each individual board of a pair being the equivalent of one half of the fixed pin board in the DAC Programmer. Various operational formats may be programmed on pairs of the pre-programmable boards, thereby facilitating rapid conversion from one format or program to another. The programming for the pre-programmable boards is identical to that discussed previously for the fixed boards except that threaded diode plugs are used. This is to prevent the plugs from disengaging when mating the pre-programmable board with the fixed board.

NOTE

Paralleling of two DACs with common data channel inputs may be accomplished by using an additional diode plug. For example, if the Units 0 and Tens 1 and 2 holes for a specific channel were plugged, data for that channel would be processed by DACs 10 and 20. Due to loading factors, paralleling of more than two DACs is not recommended.

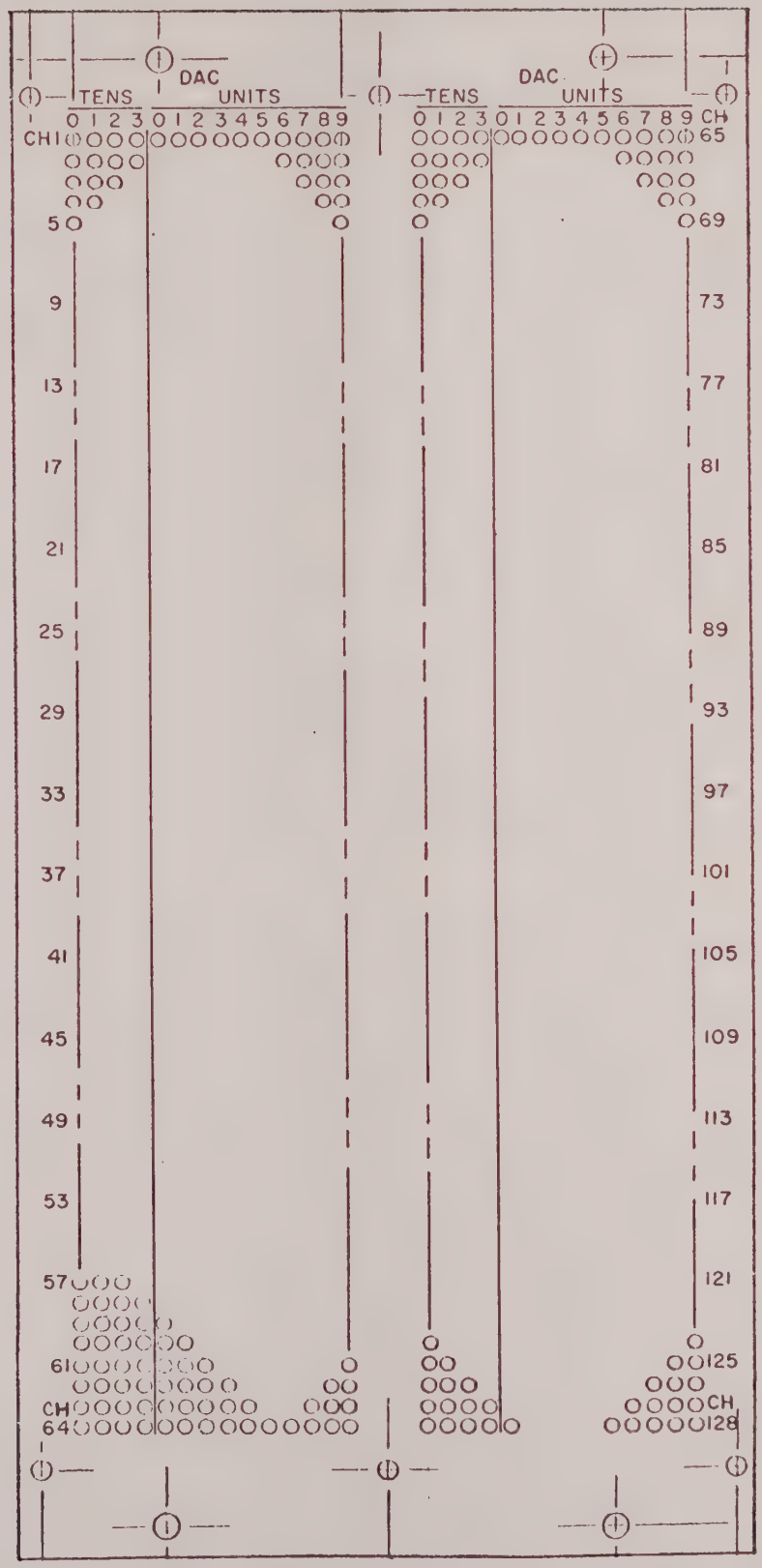


Figure 3-2. DAC Programmer Assembly Matrix Board

SECTION 4

THEORY OF OPERATION

4.1 GENERAL

This section contains the functional theory of operation for the Model 516 Demultiplexer. The information presented in this section outlines normal operation of the various circuits of the Model 516 and, as such, should be used as a guide for isolating circuit faults in the event of a malfunction. The theory descriptions are provided at two discrete levels. An overall block diagram description based on the system block diagram, Figure 4-1, is provided in paragraph 4.2. Detailed circuit descriptions for each functional circuit group shown in Figure 4-1 are provided in paragraph 4.3.

4.2 BLOCK DIAGRAM ANALYSIS (REF. FIGURE 4-1)

All input signals for the Model 516 (10-bit parallel data input, channel rate pulses, and frame rate pulses) are applied to rear panel connector A3J6 from the input source device (EMR Model 515 PAM Synchronizer or similar device) and routed to associated buffer stages on logic card J1. A buffered output for each of the twelve digital input lines is applied to output connector A3J8. These outputs allow the user to drive additional Model 516's or any other device requiring corresponding input signals.

The buffered channel rate output from card J1 is also applied to the clock input of the channel counter in DAC Programmer assembly A4. The channel counter is incremented by the channel rate pulses and reset by the buffered frame rate pulses thereby recreating the basic channel identification of the input data source. The seven-bit channel counter has the capability of producing 128 discrete binary count outputs. Each sequential count produced by the counter is decoded to provide a single logic ZERO input on one of 128 input lines to the program board. Diode pins inserted in the program board for a given channel provide for associating the binary input data for this channel with a specific digital-to-analog converter circuit. For example, if diode pins are inserted in TENS = 0 and UNITS = 4 holes for channel 2 on the program board, when the channel count = 2 line to the program board is a logic ZERO, logic ZERO levels are applied to the T0 and U4 buffer stages on assembly A4. The buffered (logic ONE level) U4 output is routed to DAC circuits 4, 14, and 24 via the interconnection board. The T0 input to the buffer is gated by the channel rate pulse to provide the T0 pulse input (logic ONE level) for DAC's 1 through 9. Thus, for this example, logic ONE coincidence is provided at the input gate of DAC 4 (card J9) at channel 2 time causing the eight most significant bits of the buffered input data to be loaded into the DAC storage. The DAC circuit converts the stored binary data to a representive analog level and routes the resultant analog value to the appropriate output connector (DAC's 1 through 16

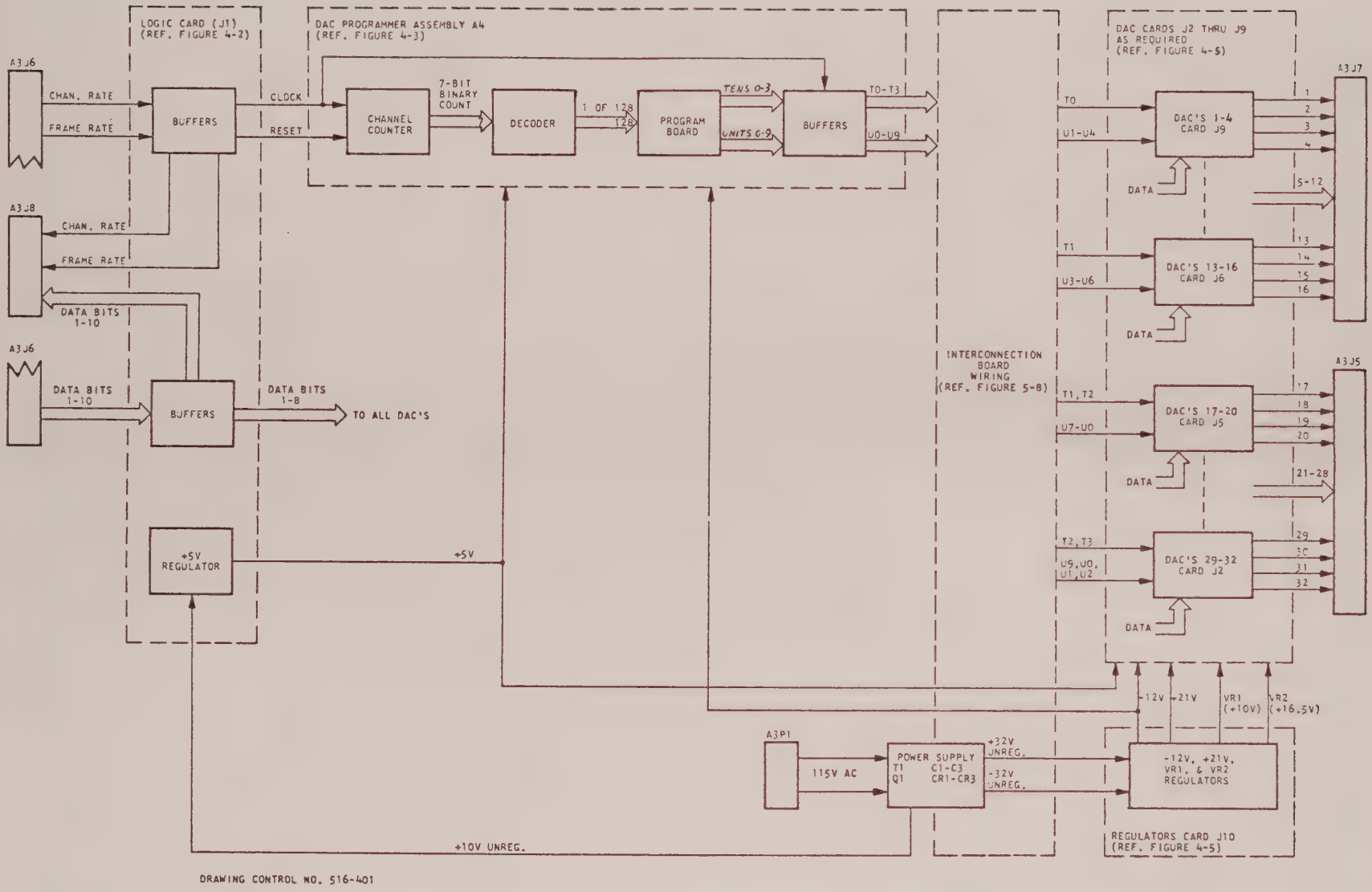


Figure 4-1. Model 516 Demultiplexer Overall Block Diagram

to connector A3J7 and DACs 17 through 32 to connector A3J8). Each channel of the input data format may be routed to any one of the DAC circuits in a similar manner. Supercommutation or strapping of input channels is accomplished by routing more than one channel to a single DAC.

The Model 516 is provided with a self-contained power supply and regulator circuits which furnish all DC operating voltages for the unit. The +5V regulator, located on logic card J1, and the -12V and +21V regulators located on regulator card J10, provide the primary DC levels for operation of logic circuits throughout the Model 516. Regulators VR1 (+10.000 volts) and VR2 (+6.500 volts with respect to VR1) provide precision DC reference levels for the digital-to-analog conversion functions.

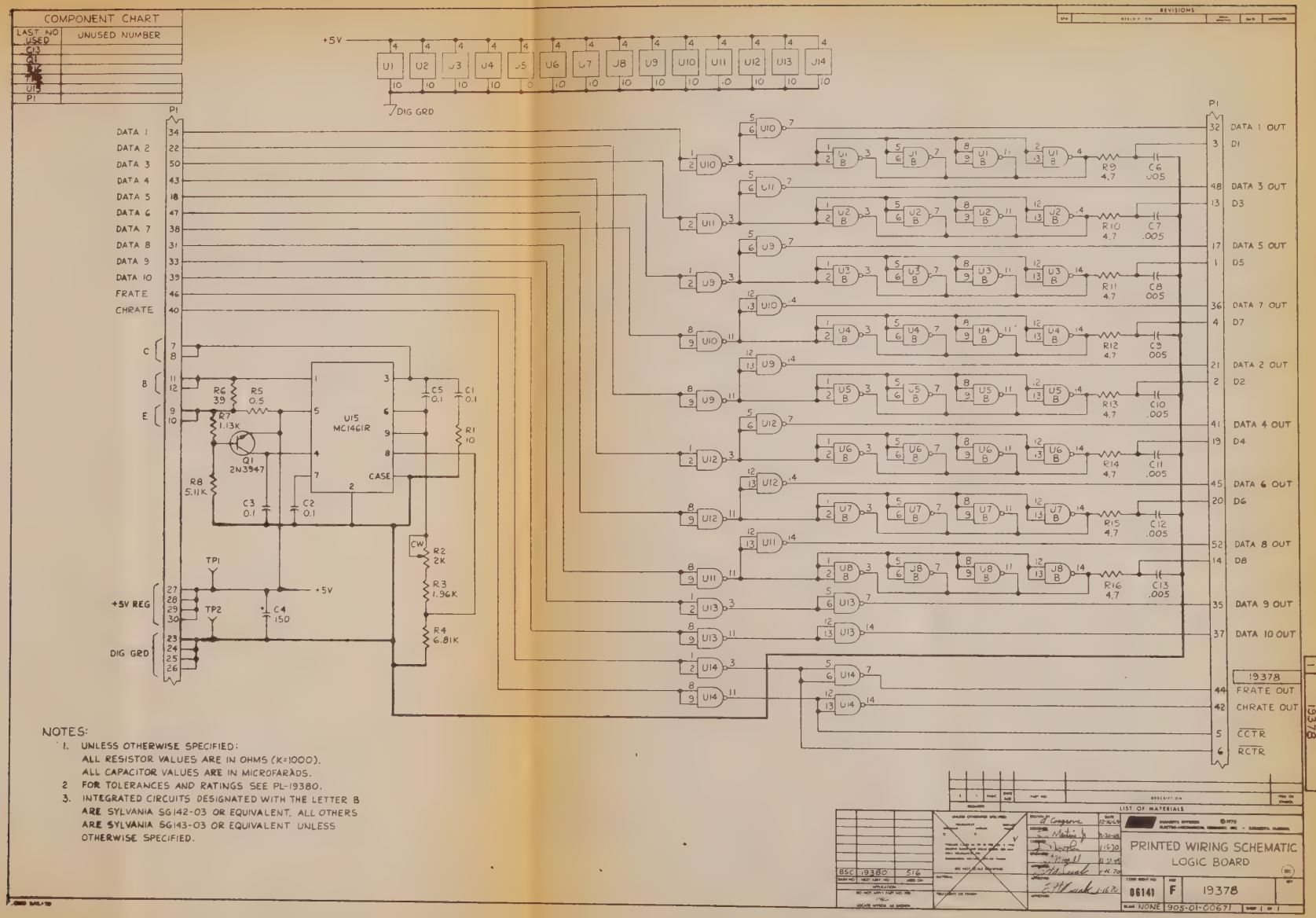
4.3 DETAILED CIRCUIT DESCRIPTIONS

4.3.1 Logic Card J1 (Ref. Figure 4-2)

The logic printed-wiring board assembly (card location J1) is composed of twelve independent buffer circuits and a +5V regulator. The buffer circuits associated with data bits 1 through 8 of the 10-bit parallel binary input are identical; and the four buffer circuits associated with input data bits 9 and 10, the channel rate pulse (CHRATE), and the frame rate pulse (FRATE) are similar. Therefore, only typical buffer circuits are discussed in detail.

The buffer circuit, associated with input data bit 1, is composed of two NAND gate stages located on IC U10 and four parallel connected NAND stages on IC U1. The DATA 1 input signal level at pin P1-34 is inverted twice by the NAND stages on U10 and coupled via pin P1-32 to rear panel output connector A3J5 as the DATA 1 OUT signal. Exclusive of the approximate delay of 20 nanoseconds inherent in the NAND gates, the output signal is identical to the received input. The output of the first NAND stage, U10-3, is applied to four parallel connected NAND stages. The output from these stages, D1, is applied simultaneously to the bit 1 data input for each digital-to-analog converter circuit in the Model 516. The parallel connected NAND gates provide the capability for driving the maximum complement of 32 DAC circuits. The buffer circuits for input data bits 9 and 10, CHRATE, and FRATE are similar except the parallel connected NAND gate stages are not required. The inversion of the CHRATE and FRATE input signals are also provided as outputs from the associated buffer circuits as $\overline{\text{CCTR}}$ and $\overline{\text{RCTR}}$ pulses, respectively, for use by the channel counter on DAC Programmer assembly A4.

The +5 volt regulator is composed of a monolithic regulator circuit (U15), output transistor Q1, and output calibration control R2 located on logic card J1. The series pass transistor for this regulator is mounted on a heat sink near the fan in order to more efficiently dissipate heat. (See Figure 5-1.) The 5-volt regulator is designed to provide up to 3.2 amperes for operation of the Model 516. Current limiting begins at this point, protecting the



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS (K=1000).
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. FOR TOLERANCES AND RATINGS SEE PL-19380.
3. INTEGRATED CIRCUITS DESIGNATED WITH THE LETTER B ARE SYLVANIA SG142-03 OR EQUIVALENT. ALL OTHERS ARE SYLVANIA SG143-03 OR EQUIVALENT UNLESS OTHERWISE SPECIFIED.

FIGURE 4-2 LOGIC CARD (J1)
SCHEMATIC DIAGRAM

circuit from overload. Design specifications for the 5-volt regulator are as follows:

a. Output Voltage: +5 volts ±1%.

b. Output Current: 0.3A to 3.2A.

c. Output Ripple: Less than 10 mv peak-to-peak.

4.3.2 DAC Programmer Assembly A4 (Ref. Figure 4-3)

The front panel plug-in DAC Programmer assembly provides for manual routing of specific input channels to selected digital-to-analog converter circuits. The assembly is functionally composed of a 7-bit binary counter and drivers (U15 through U18), a 1-of-128 decoder (U1 through U8), a diode pinboard, and buffer circuits (U9 through U14). The 7-bit binary counter is incremented by the channel rate $\overline{\text{CCTR}}$ pulses received from logic card J1 and reset by the frame rate $\overline{\text{RCTR}}$ pulses. The counter, thereby, recreates a 7-bit binary channel identification corresponding to the channel numbering of the input data source. The seven counter stages allow a maximum of 128 discrete binary counts or a maximum of 128 channels per frame.

The decoder circuit consists of eight independent one-of-sixteen decoder stages. Each decoder stage monitors specific counts of the channel counter and produces an active low-level output on one-of-sixteen output lines when the input conditions for that line are properly enabled. Table 4-1 shows the truth table for individual decoder stages.

Table 4-1. Decoder Stage Truth Table

INPUT FUNCTIONS						OUTPUT FUNCTIONS											
Eo	EI	A_0	A_1	A_2	A_3	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
H	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
H	L	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	H	L	L	L	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	H	H	L	L	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	H	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H
L	L	H	L	H	L	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H
L	L	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H
L	L	L	L	L	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H
L	L	H	L	L	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H
L	L	L	H	L	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H
L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H
L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H
L	L	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H
L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L

H = High Voltage Level
L = Low Voltage Level
X = Level Does Not Affect Output

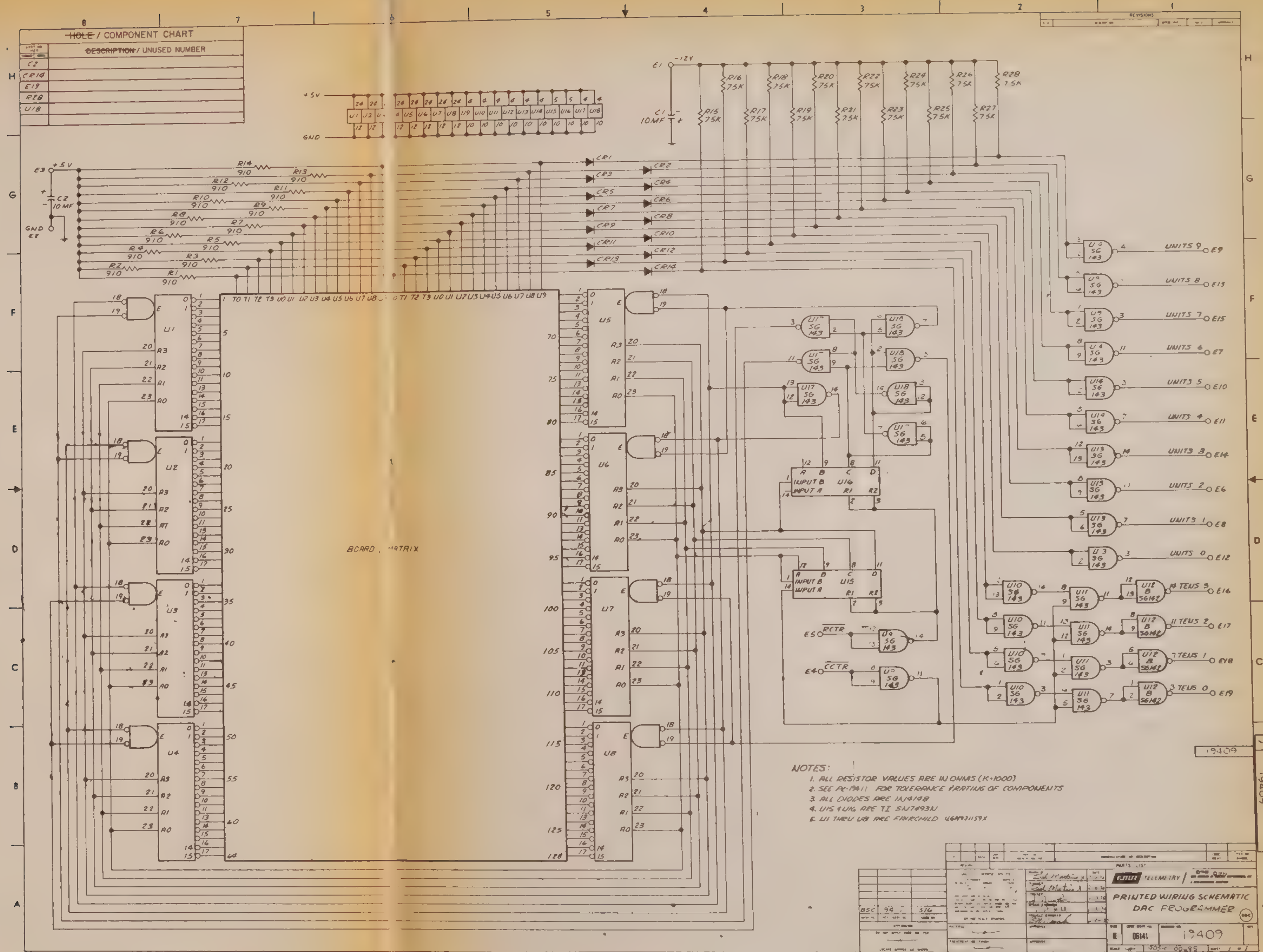

HOLE / COMPONENT CHART
DESCRIPTION / UNUSED NUMBER
C2
CR14
E19
R28
U18
+5V
GND
E3
E2
C2 10 MF
E1
-12V
C1 10MF
R1 910
R2 910
R3 910
R4 910
R5 910
R6 910
R7 910
R8 910
R9 910
R10 910
R11 910
R12 910
R13 910
R14 910
R15 75K
R16 75K
R17 75K
R18 75K
R19 75K
R20 75K
R21 75K
R22 75K
R23 75K
R24 75K
R25 75K
R26 75K
R27 75K
R28 75K
CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
CR10
CR11
CR12
CR13
CR14
U1
U2
U3
U4
U5
U6
U7
U8
BOARD, MATRIX
U16
U15
INPUT B
INPUT A
E5 RCTR
E4 CCTR
UNITS 9 E9
UNITS 8 E13
UNITS 7 E15
UNITS 6 E7
UNITS 5 E10
UNITS 4 E11
UNITS 3 E14
UNITS 2 E6
UNITS 1 E8
UNITS 0 E12
TENS 3 E16
TENS 2 E17
TENS 1 E18
TENS 0 E19
NOTES:
1. ALL RESISTOR VALUES ARE IN OHMS (K=1000)
2. SEE PL-PA11 FOR TOLERANCE & RATING OF COMPONENTS
3. ALL DIODES ARE 1N4148
4. U15 & U16 ARE TI SN7493N
5. U1 THRU U8 ARE FAIRCHILD U6N9311 59X
EMR TELEMETRY
PRINTED WIRING SCHEMATIC
DAC PROGRAMMER
E
06141
19409

FIGURE 4-3 DAC PROGRAMMER (A4)
SCHEMATIC DIAGRAM

Thus, the eight decoder stages provide 128 output lines to the diode pinboard and are arranged so that only one line may be at the active low-level at any given time as determined by the counter content.

The diode pinboard provides for routing the low-level channel identification pulses provided by the decoder circuit to specific digital-to-analog converter circuits. The programming instructions for the diode pinboard were described in detail in Section 3 of this manual. The activated (low-level) decoder line to the pinboard enables the units and tens selection lines programmed for the activated channel. That is, if channel 1 on the pinboard were programmed for DAC 10, low-level outputs would be routed to the units 0 and tens 1 output buffer gates when the decoder identifies channel 1. High-level inputs (logic ONEs) are applied to all other units and tens selection buffer stages. The 10 unit digit buffer circuits are each a single input NAND gate providing logic level inversion. The four tens digit buffer circuits each consist of three NAND gate stages. The tens digit buffer stages are gated by the positive-going CCTR (channel rate) pulses used to clock the channels counter. Thus, the selected tens digit output is a positive-going pulse of a duration approximately equal to the CHRATE input pulse, and the selected units digit output is a logic ONE level for the channel period. Figure 4-4 illustrates the programming and timing for typical DAC selection using a simple five channels-per-frame format.

4.3.3 Digital-to-Analog Converter Cards, J2 through J9 (Ref. Figure 4-5)

Each Model 516 can contain from one to eight digital-to-analog converter printed-wiring boards with each board consisting of four identical DAC circuits. Since the operation for each DAC is the same, only the operation of DAC circuit 1 on Figure 4-5 is discussed below.

The DAC 1 circuit consists of two 4-bit storage registers (U1 and U2), two monolithic switch arrays (U3 and U4), a binary weighted ladder (R9 through R24), a current summing amplifier (U5), and a logic switch (U6). The eight most significant bits of each input data channel are wired from the buffer stages on logic card J1 to the associated storage locations in all DAC circuits. The data bits are loaded into the storage registers by strobe (clock) pulses produced by the input switch. A strobe pulse is generated by "AND'ing" a units selection line and a tens selection line from the DAC Programmer assembly. A unique combination of units and tens selection lines is provided for each DAC circuit in the Model 516. When both lines for a specific DAC are high (logic ONE levels), the storing of binary data inputs to that DAC is enabled. Since the "tens" line is "AND'ed" with the channel rate pulses in the DAC Programmer, the registers are effectively strobed by the channel rate pulses. Timing is such that the input data bits are stable during the strobe pulses.

Data bit outputs from the storage register control transistor switches. These switches in turn control the current flow in a binarily weighted resistive ladder network. As switches are turned on, current is allowed to flow through the

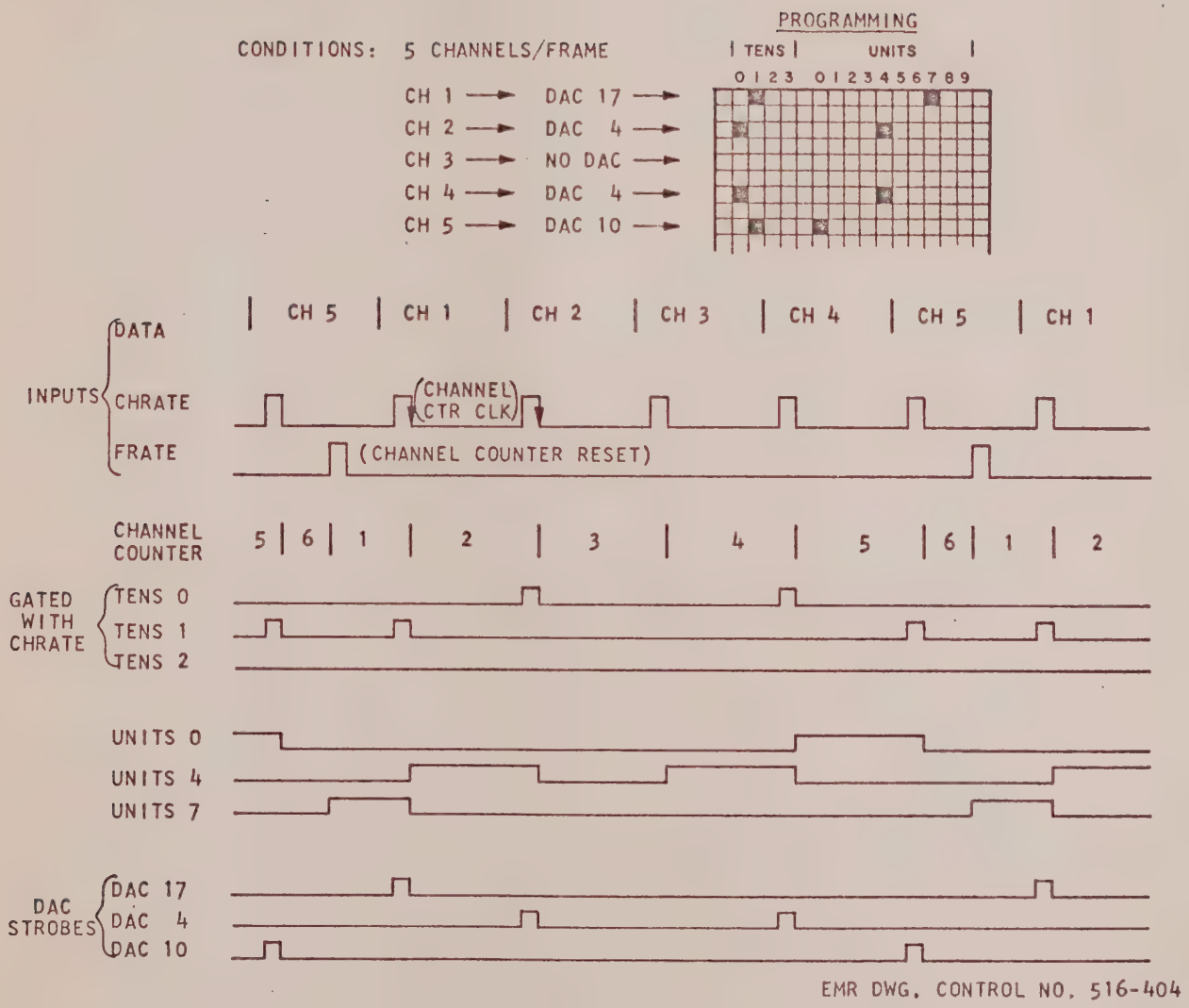


Figure 4-4. DAC Programmer Timing Diagram

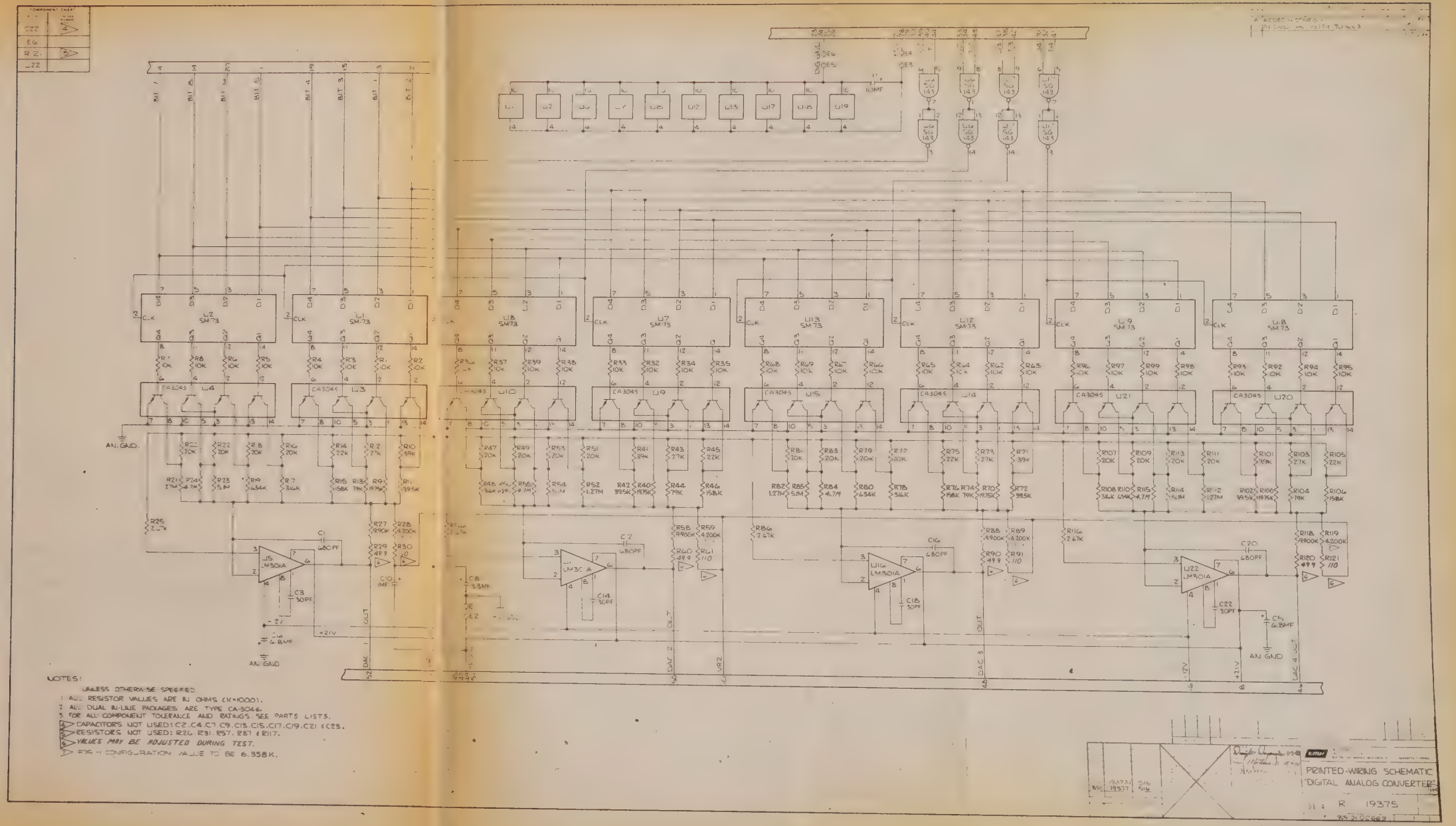
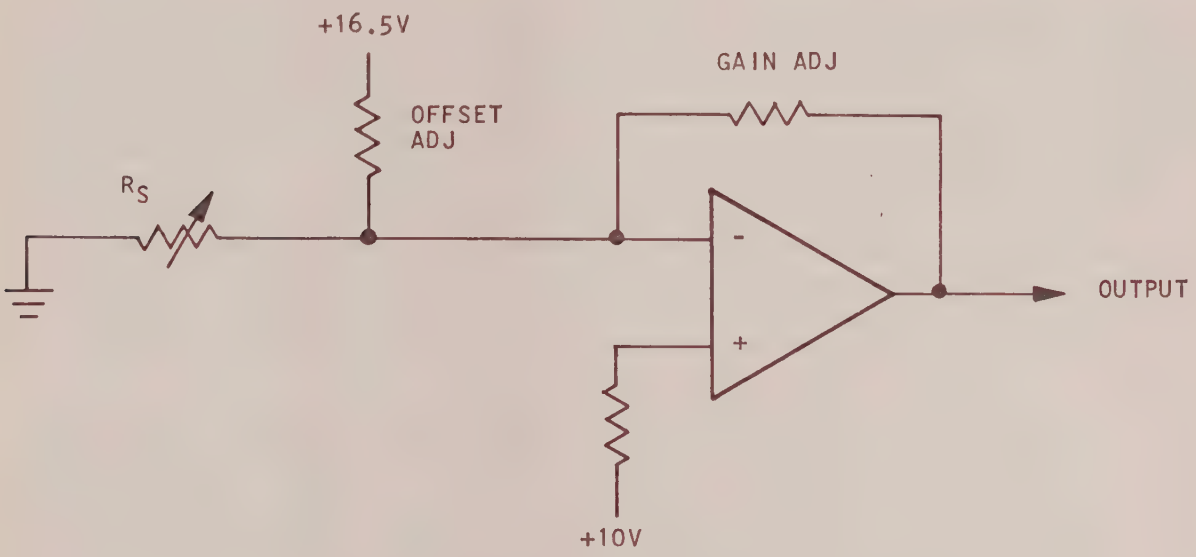

NOTES:
UNLESS OTHERWISE SPECIFIED
1 ALL RESISTOR VALUES ARE IN OHMS (K=1000).
2 ALL DUAL IN-LINE PACKAGES ARE TYPE CA-3046.
3 FOR ALL COMPONENT TOLERANCE AND RATINGS, SEE PARTS LISTS.
4 CAPACITORS NOT USED: C2, C4, C7, C9, C13, C15, C17, C19, C21 & C23.
5 RESISTORS NOT USED: R26, R31, R57, R87 & R117.
6 VALUES MAY BE ADJUSTED DURING TEST.
7 R76 - 1 CONFIGURATION VALUE TO BE 6.358K.
PRINTED-WIRING SCHEMATIC
DIGITAL ANALOG CONVERTER
R 19375

FIGURE 4-5
DIGITAL-TO-ANALOG CONVERTER
CARD, J2 THROUGH J9, SCHEMATIC DIAGRAM

binarily weighted resistors in the ladder. The higher the bit position of the storage register outputs, the higher the current flow permitted in the ladder network. Current from the ladder network is summed at the inverting input of an integrated-circuit operational amplifier. The positive input of the amplifier is connected through a resistor to a +10-volt reference voltage. The general configuration of the amplifier and associated components is shown in the following diagram:



Resistor R_s is the resistive ladder network which supplies current based on the bit switching from the storage register outputs. The OFFSET resistor is used to set the analog OUTPUT voltage in a quiescent state (all logic ZERO's at the input). The GAIN resistor is used to set the full-scale analog OUTPUT for an all logic ONE's at the input.

As bit switches are turned on, the resulting summed current is supplied to the minus input of the amplifier. The amplifier then provides an output voltage representative of the summed current. With all bit switches off, the current is at the minimum level and the amplifier output voltage is at the minimum voltage established by the OFFSET adjustment. As bit switches are turned on, the current increases in binary steps and the amplifier output increases correspondingly. With all bit switches on, the current is at the maximum level and the amplifier output voltage is maximum as established by the GAIN adjustment.

The output voltage range is either −5 to +5 volts or 0 volt to +10 volts depending on the particular unit (see Figure 2-1). The DAC card configuration is identical for both DAC card types. Only the value of the offset adjust resistor for the summing amplifier differs to provide the respective output voltage ranges.

4.3.4 Regulator Card J10 (Ref. Figure 4-6)

Input power for the Model 516 is supplied by the AC line voltage; either 115V AC or 230V AC, depending on the power source and the wiring of the primary windings of power transformer A1T1. (Refer to Figure 5-8.) The outputs of the three secondary windings are rectified and filtered and routed to appropriate regulator circuits on logic card J1 and regulator card J10.

The +5-volt regulator circuit located on card J1 was discussed in paragraph 4.3.1. A -12-volt regulator, +21-volt regulator, and two reference supplies, VR1 and VR2, are located on the regulator printed-wiring board. The +21-volt regulator circuit consists of a monolithic regulator, U1, series pass transistors Q1 and Q2, and current limiting stage Q3. The series pass transistors provide for increasing the normal current output of regulator U1 (150 ma maximum) up to 500 ma. Current limiting for the 21-volt regulator occurs between 0.7 amps and 1.2 amps depending upon the operating temperature. Output voltage calibration for the regulator is accomplished by adjustment of potentiometer R8. Although the monolithic regulator circuit is nonrepairable, the schematic diagram for this device is provided in Figure 4-7 for reference purposes.

The -12-volt regulator circuit is composed of regulator U2, series pass transistor Q4, and current limiter Q5. Source voltage for the -12-volt regulator is the unregulated output of rectifier A1CR3 located on the interconnection board. The regulator with its external booster stages provides ±1% regulation of the output voltage level with an output current of from 0 to 160 ma. The output level is adjusted by means of potentiometer R13. Regulator U2 is shown schematically in Figure 4-8 for reference.

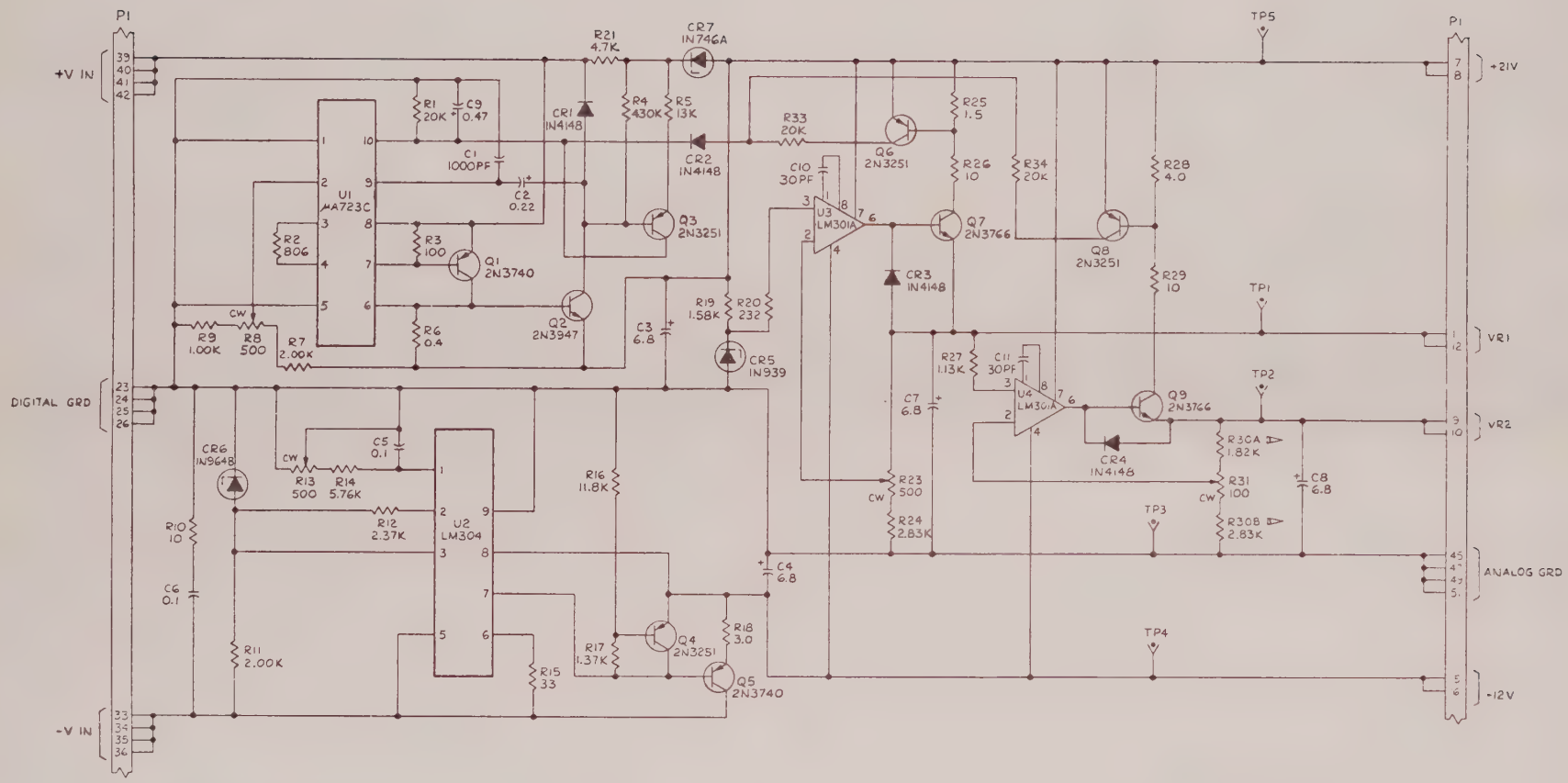
The VR1 and VR2 reference voltage supplies utilize monolithic operational amplifier stages driving external series pass transistors to increase the output drive capabilities. The noninverting input to operational amplifier U3 in the VR1 supply is referenced to a temperature compensated zener diode, CR5. The output of amplifier U3 is coupled to the digitial-to-analog converter circuits through series pass transistor Q7. Feedback control R23 provides for adjustment of the VR1 output at a nominal level of +10.000 volts. Current limiting is provided by transistor stage Q7. The output specifications for reference supply VR1 are as follows:

a. Output Voltage -- +10.0000 ±.010V.

b. Output Current -- 0 to 160 ma.

c. Noise and Ripple -- Less than 1 mv rms.

The VR2 reference supply is functionally identical to the VR1 supply. The noninverting input to operational amplifier U4 is referenced to the output of the VR1 supply. Therefore, variations in the difference between the VR1 and VR2 outputs are minimized. The output level of VR2 is adjusted for +16.500 volts with respect to ground (+6.500 volts with respect to the output of VR1)



NOTES.

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS (K=1000).
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. FOR COMPONENT RATING AND TOLERANCE, SEE PL-19383.
3. R30A AND R30B ARE MATCHED PAIR RESISTORS. SEE PARAGRAPH 5.3, REPAIRS, BEFORE REPLACING.
4. EMR DRAWING NO. 19381, REV. ___, (MODIFIED).

Figure 4-6. Regulator Card J10 Schematic Diagram

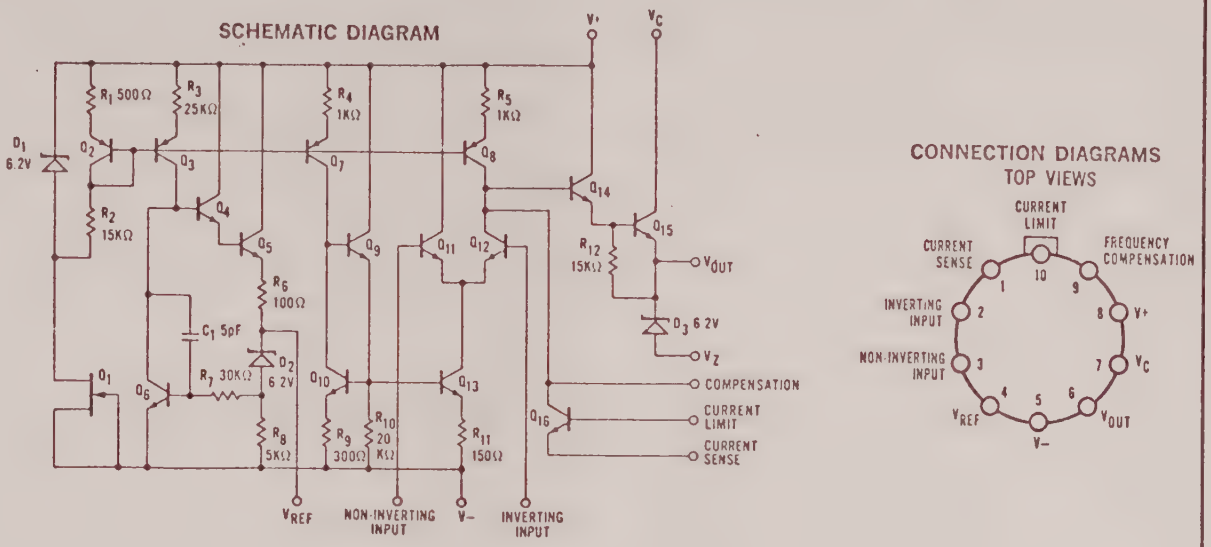


Figure 4-7. Voltage Regulator (U1) Integrated Circuit

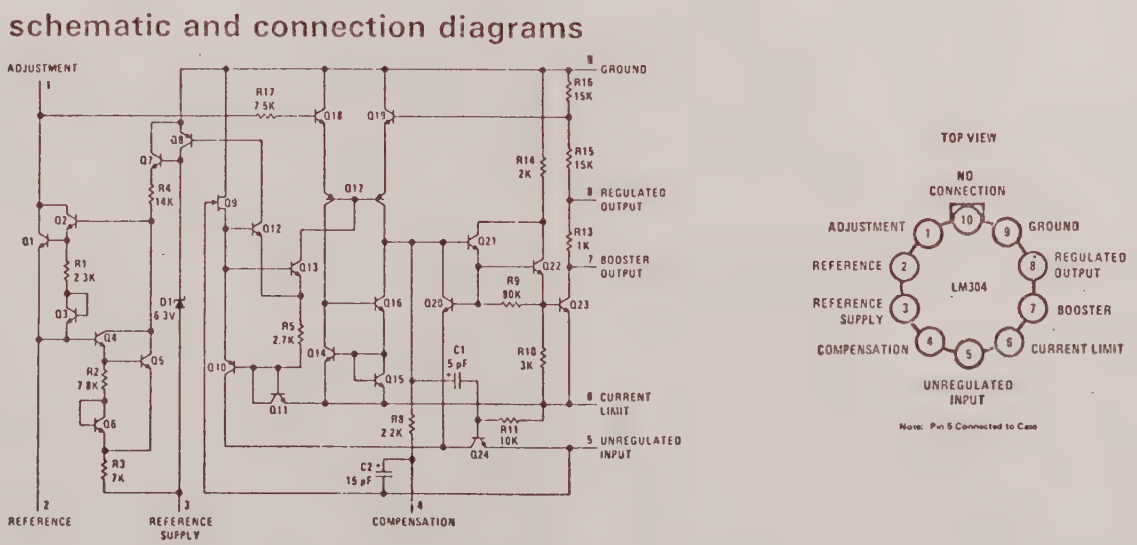


Figure 4-8. Negative Voltage Regulator (U2) Integrated Circuit

by means of potentiometer R31. Current drive is provided by series pass transistor Q9 and current limiting is provided by transistor stage Q8. The output specifications for the VR2 supply, which is also used as a reference source for all DAC circuits in the Model 516, are as follows:

a. Output Voltage -- +6.5000 ±.7 (VR1-10) ±.0030.

b. Output Current -- 0 to 60 ma.

c. Noise and Ripple -- Less than 1 mv rms.

SECTION 5

MAINTENANCE

NOTE

Any malfunctions detected in this unit during the warranty period should be referred to EMR-Telemetry for repair. Attempted repair by the user during the warranty period may void the factory warranty. The information provided in this section is for the purpose of aiding the user who must make repairs under emergency conditions or chooses to attempt repairs under normal conditions.

5.1 GENERAL

This section contains information to aid in troubleshooting the Model 516 Demultiplexer and for restoring the unit to its optimum operational status in the event an abnormal condition is detected. The information provided in this section is intended to supplement the theory of operation descriptions provided in Section 4 so that maintenance may be performed with maximum efficiency. Included in the maintenance information are a troubleshooting guide, assembly diagrams for major assemblies of the Model 516, and interconnection wiring diagrams and wire lists.

5.2 TROUBLESHOOTING

A malfunction of the Model 516 will be indicated either by abnormal operation for a single output channel resulting from failure of the associated digital-to-analog converter circuit or by abnormal indications for all or many of the output channels resulting from failure of the power supply and regulation circuits or the input and DAC programming circuits. The following guide provides a general approach to checkout and repair of the Model 516:

a. Perform a visual inspection (paragraph 5.2.1).

b. Check the power supply and voltage regulator circuits for proper operation (paragraph 5.2.2).

c. Perform the operational checks using simulated input data (paragraph 5.2.3).

d. Refer to paragraph 5.3, Repairs, before replacing defective components.

5.2.1 Inspection

The Model 516 should be subjected to a regular inspection program. The inspection should be performed periodically as a means of preventive maintenance or, if a malfunction occurs, to aid in isolating the trouble. An inspection should include the following:

a. Inspect front and rear panel components for signs of damage or looseness.

b. Remove the cover and inspect the internal wiring of the chassis and plug-in assemblies for loose or broken connections.

c. Inspect plug-in assemblies for mechanical damage or component discoloration.

NOTE

Do not replace any component before reading the instructions contained in paragraph 5.3, Repairs.

5.2.2 Power Supply and Regulators Checkout and Adjustment Procedures

Use the following procedure to check and, where applicable, adjust the power circuits for the Model 516. If normal indications cannot be obtained, refer to the circuit descriptions and schematic diagrams provided in Section 4 to isolate the source of trouble.

a. Check the 1-ampere fuse, F1, on the rear panel of the unit.

b. Connect the input power cord to the primary power source and energize the unit by means of the front panel POWER switch. The fan should be turning.

c. Using a VTVM, check the unregulated DC outputs of the power supply at the filter capacitors on the interconnection board. All measurements are with respect to digital ground (connector J2 on the rear panel).

Test Point	Nominal Indication
C1 (+)	+21 ±4V DC
C2 (+)	+37 ±3V DC
C3 (–)	–37 ±3V DC

d. Using a digital voltmeter, check and adjust the regulated DC outputs as identified in Table 5-1.

NOTE

Allow the unit to operate for 10 minutes (minimum) before adjusting the regulated voltage levels.

5.2.3 Operational Test Procedures

5.2.3.1 DAC Selection Capability Test

Drive the Model 516 Demultiplexer with a PAM/PCM Synchronizer Simulator (such as an EMR Model 517 and EMR Model 515 combination) or any similar device capable of providing 10-bit paralleled binary outputs at channel rates up

Table 5-1. Regulated Output Voltages Test and Adjustment Data

SUPPLY	TEST POINT	REFERENCE	OUTPUT	ADJUST
+ 5V	Card 1, TP1	Card 1, TP2	+ 5.000 ± 0.050V DC	Card 1, R2
-12V	Card 10, TP4	Card 10, TP3	-12.000 ± 0.025V DC	Card 10, R13
+21V	Card 10, TP5	Card 10, TP3	+21.000 ± 0.025V DC	Card 10, R8
VR1	Card 10, TP1	Card 10, TP3	+10.000 ± 0.0010V DC	Card 10, R23
VR2*	Card 10, TP2	Card 10, TP1	+6.5000 ± 0.0005V DC	Card 10, R31

* Measure VR2 output with reference to output of VR1 using a differential voltmeter; low-side to VR1 output (Card 10, TP1).

to 100,000 channels per second. The driving device must also be capable of providing appropriate channel rate pulses and a variable frame rate output which will allow programming of frame lengths of from 1 to 128 channels. The Model 516 should meet the following operational requirements:

NOTE

For the following requirements, the driving device should be operating at a rate of 100,000 channels per second.

a. Any of the 128 channels of the input format can be routed to any of the DAC circuits in the Model 516 by programming of the DAC Programmer assembly.

b. The Model 516 will handle frame lengths of from 1 to 128 channels.

c. The parallel data at output connector A3J8 are identical to the input data except for the inherent delays of the input buffers (approximately 20 nanoseconds).

d. The diode pins used for programming the DAC Programmer assembly are good.

5.2.3.2 Digital-to-Analog Converter Circuit Gain and Linearity Test

NOTE

Before performing the following procedures, verify that the power supply is calibrated as outlined in paragraph 5.2.2.

a. Program the driving device to provide a binary value of 1000000000 for ±5-volt units or 0000000000 for 0-volt to +10-volt units on a known channel.

b. Program the DAC Programmer to route the known channel data to a specific DAC circuit of the Model 516.

c. Connect a digital voltmeter to the output connector pin for the selected DAC (see Table 5-3) and adjust potentiometer R31 (VR2 adjustment) on the regulator card to obtain an indication of 0.0000 ±0.0005V.

d. Sequentially program the driving device for the binary values identified below while checking that the DAC output is within the tolerance listed for each word.

Bit No.	Binary Input (To ±5-Volt Units)	Binary Input (To 0-Volt to +10-Volt Units)	Contribution to DAC Output
	1 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0.0000 ±.0005V
1	0 0 0 0 0 0 0 0	1 0 0 0 0 0 0 0	5.020 ±.010V
2	1 1 0 0 0 0 0 0	0 1 0 0 0 0 0 0	2.510 ±.006V
3	1 0 1 0 0 0 0 0	0 0 1 0 0 0 0 0	1.255 ±.005V
4	1 0 0 1 0 0 0 0	0 0 0 1 0 0 0 0	0.6275 ±.004V
5	1 0 0 0 1 0 0 0	0 0 0 0 1 0 0 0	0.3137 ±.004V
6	1 0 0 0 0 1 0 0	0 0 0 0 0 1 0 0	0.1569 ±.004V
7	1 0 0 0 0 0 1 0	0 0 0 0 0 0 1 0	0.0785 ±.004V
8	1 0 0 0 0 0 0 1	0 0 0 0 0 0 0 1	0.0392 ±.004V

If DAC output is not within the prescribed limits, check for the following possible causes of trouble:

1. Feedback Resistor Out of Spec -- This results in the first, second, and/or third bit contributions being out of spec in the same direction. (Numerically low or high.) The DAC can be brought in spec by changing the gain resistor as follows:

   (a) Increasing the 49.9 ohm resistor (R29, R60, R90, or R120) by 1 ohm for each millivolt increase required.

   (b) Decreasing the 49.9 ohm resistor by 1 ohm for each millivolt decrease required.

2. One of the Ladder Resistors Out of Spec -- This results in only the bit contribution associated with the one bad resistor to be out of tolerance. The questionable resistor should be measured by removing one end from the card. A meter accurate to ±.01% should be used on the .1% resistors.

3. One of the Transistor Switches Failed -- A transistor failure will normally result in one or more bits having no effect on the DAC output. The problem can be isolated by measuring the collector voltage of the questionable transistor. V_{ce} (on) should be less than 60 mv. V_{ce} (off) should be +10.000 ±.025V.

e. Repeat steps (a through d) for each DAC circuit in the Model 516.

5.2.3.3 Digital-to-Analog Converter Circuit Offset Test

a. Recalibrate the output of VR2 as described in paragraph 5.2.2.

b. Program the driving source for a binary output value of 1000000000 for ±5-volt units or 0000000000 for 0-volt to +10-volt units on a known channel.

c. Sequentially route this data channel to each DAC circuit while observing the analog output for the DAC under test. The output value shall be +0.020 ±0.025 volts for ±5-volt units and 0.0 ±0.025 volt for 0-volt to +10-volt units.

If the DAC is within gain and linearity tolerances, the only remaining sources of errors are the offset resistors and the op amp. In either case, the offset can be brought into tolerance by adjusting the offset resistor (Rx) as indicated below:

±5-VOLT UNITS		0-VOLT TO +10-VOLT UNITS	
DAC Output with Rx = 110 Ohms	Change Rx to:	DAC Output with Rx = 110 Ohms	Change Rx to:
−70 mv to > 35 mv	130 Ohms	−85 mv to > −55 mv	93.1 Ohms
−35 mv to > 5 mv	121 Ohms	−55 mv to > −25 mv	75.0 Ohms
− 5 mv to +44 mv	Leave as is	−25 mv to +25 mv	Leave as is
>44 mv to +70 mv	100 Ohms	>25 mv to +55 mv	24.9 Ohms
>70 mv to +100 mv	90.9 Ohms	>55 mv to +85 mv	10.0 Ohms

On the DAC card, Rx is R30, R61, R91, and R121 for DAC's 1, 2, 3, and 4, respectively. DAC 1 is on the right end of the card, looking at the component side. (Refer to Figure 5-3.)

Adjustment of the offset will not affect linearity. However, any changes made to correct linearity errors will affect the offset. Consequently, each DAC must pass the linearity tests (paragraph 5.2.3.2) prior to being tested for offset.

5.3 REPAIRS

The circuits of the Model 516 Demultiplexer may generally be repaired without affecting the overall unit performance or degrading specifications. However, certain circuits of the Model 516 contain components which are selected during testing (test variables) to provide optimum operation for an individual unit. When replacing a test variable component substitute with a like value component even though the nominal value identified on the schematic diagram may vary slightly.

Also, resistors R30A and R30B on the regulator card, J10, are a pair of temperature coefficient matched resistors. A pair is composed of one 180K ±0.5% resistor and one 2.830K ±0.5% resistor matched at 1 ppm/degree C temperature coefficient over a temperature range of 0°C to +60°C. If either of the matched pair resistors is found to be defective, both must be replaced. Packaged matched pair resistors are available from EMR-Telemetry (refer to Section 6, Parts Lists).

5.4 ASSEMBLY DIAGRAMS

The top level assembly breakdown for the Model 516 Demultiplexer is provided in Figure 5-1. Supplementary assembly diagrams for major assemblies identified in Figure 5-1 are provided in Figures 5-2 through 5-7. Components identified on individual assembly diagrams are described in the associated parts list contained in Section 6.

5.5 WIRING DIAGRAMS AND WIRE LIST

Figure 5-8 illustrates the interconnection wiring between the input/output terminals on the mother board and the individual printed-wiring board connectors. This diagram also shows schematically the interconnection wiring for the primary power supply. All other wiring for the Model 516 is identified in Table 5-2, Model 516 Wire List. An input/output connector pin function list is provided in Table 5-3.

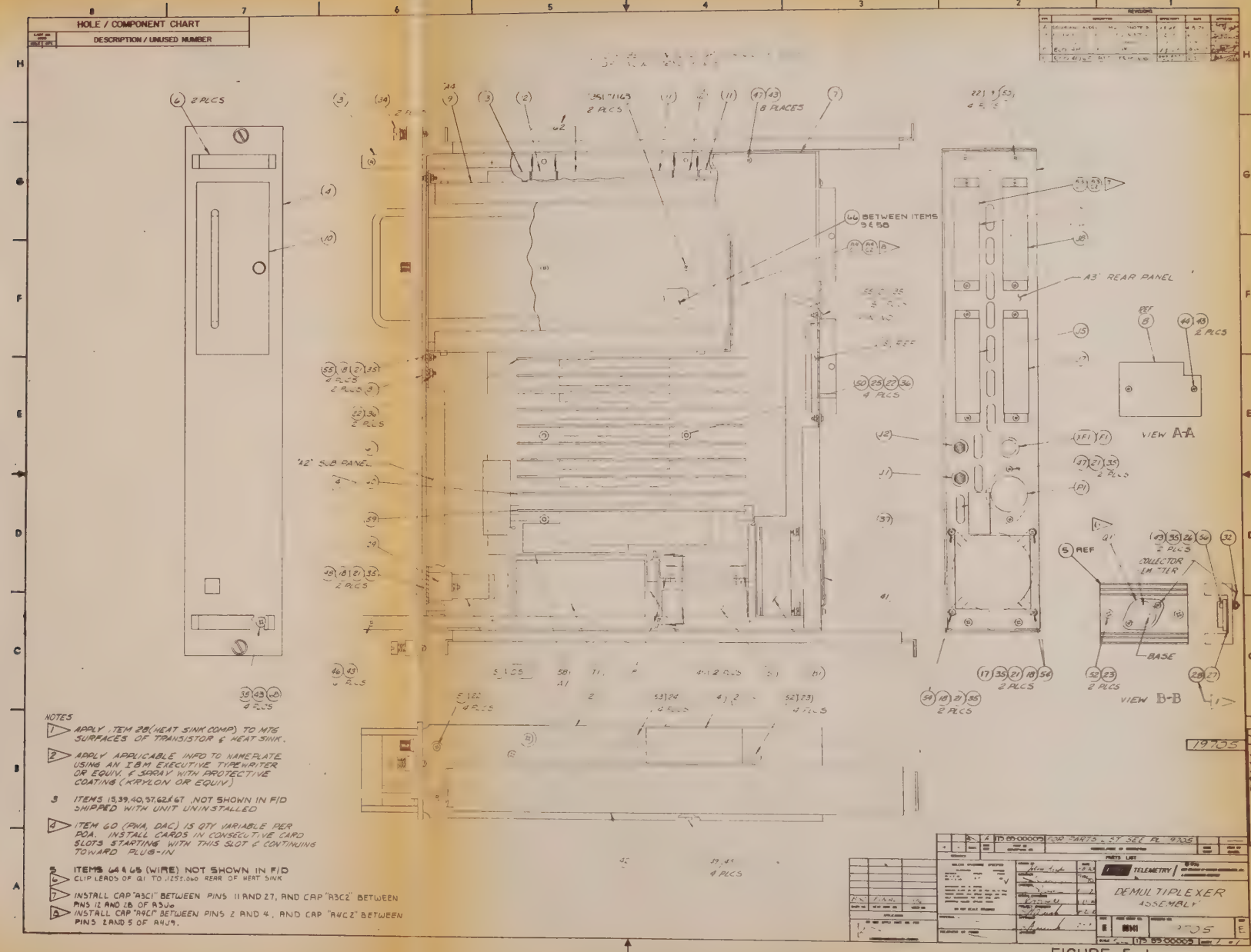

HOLE / COMPONENT CHART
DESCRIPTION / UNUSED NUMBER
REVISIONS
2 PLCS
8 PLACES
BETWEEN ITEMS 5 & 58
A3 REAR PANEL
A2 SUB PANEL
VIEW A-A
VIEW B-B
REF
COLLECTOR EMITTER
BASE
4 PLCS
2 PLCS
NOTES
1 APPLY ITEM 28 (HEAT SINK COMP) TO MTG SURFACES OF TRANSISTOR & HEAT SINK.
2 APPLY APPLICABLE INFO TO NAMEPLATE USING AN IBM EXECUTIVE TYPEWRITER OR EQUIV. & SPRAY WITH PROTECTIVE COATING (KRYLON OR EQUIV.)
3 ITEMS 18,39,40,57,62 & 67 NOT SHOWN IN F/D SHIPPED WITH UNIT UNINSTALLED
4 ITEM 60 (PWA, DAC) IS QTY VARIABLE PER PDA. INSTALL CARDS IN CONSECUTIVE CARD SLOTS STARTING WITH THIS SLOT & CONTINUING TOWARD PLUG-IN
5 ITEMS 64 & 65 (WIRE) NOT SHOWN IN F/D
6 CLIP LEADS OF Q1 TO .125±.060 REAR OF HEAT SINK
7 INSTALL CAP "A3C1" BETWEEN PINS 11 AND 27, AND CAP "A3C2" BETWEEN PINS 12 AND 28 OF A3J6.
8 INSTALL CAP "A4C1" BETWEEN PINS 2 AND 4, AND CAP "A4C2" BETWEEN PINS 2 AND 5 OF A4J9.
FOR PARTS LIST SEE FL 19705
PARTS LIST
TELEMETRY
DEMULTIPLEXER ASSEMBLY
19705

FIGURE 5-1
MODEL 516 DEMULTIPLEXER
ASSEMBLY DIAGRAM

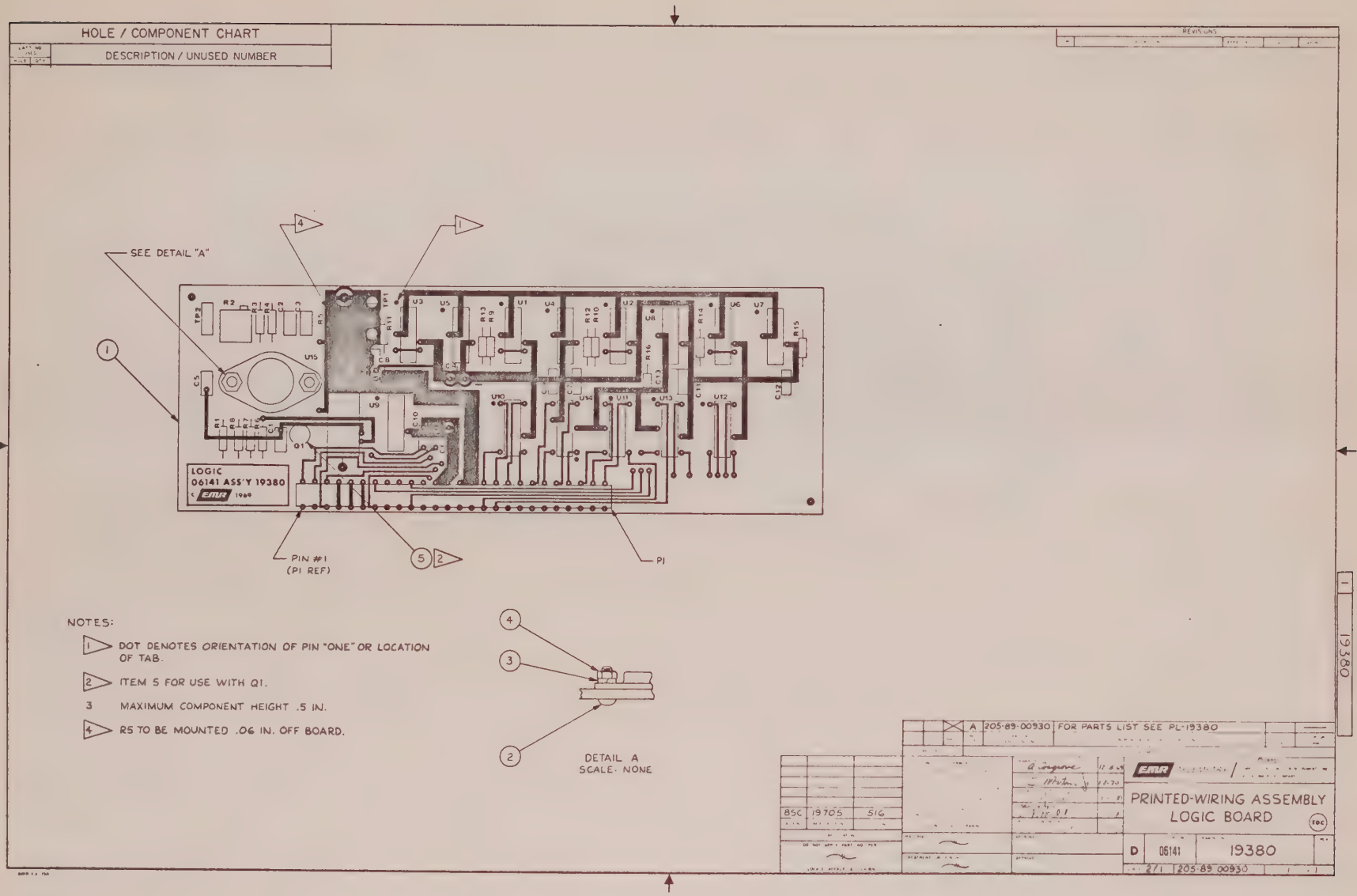


Figure 5-2. Logic Card (J1) Assembly Diagram

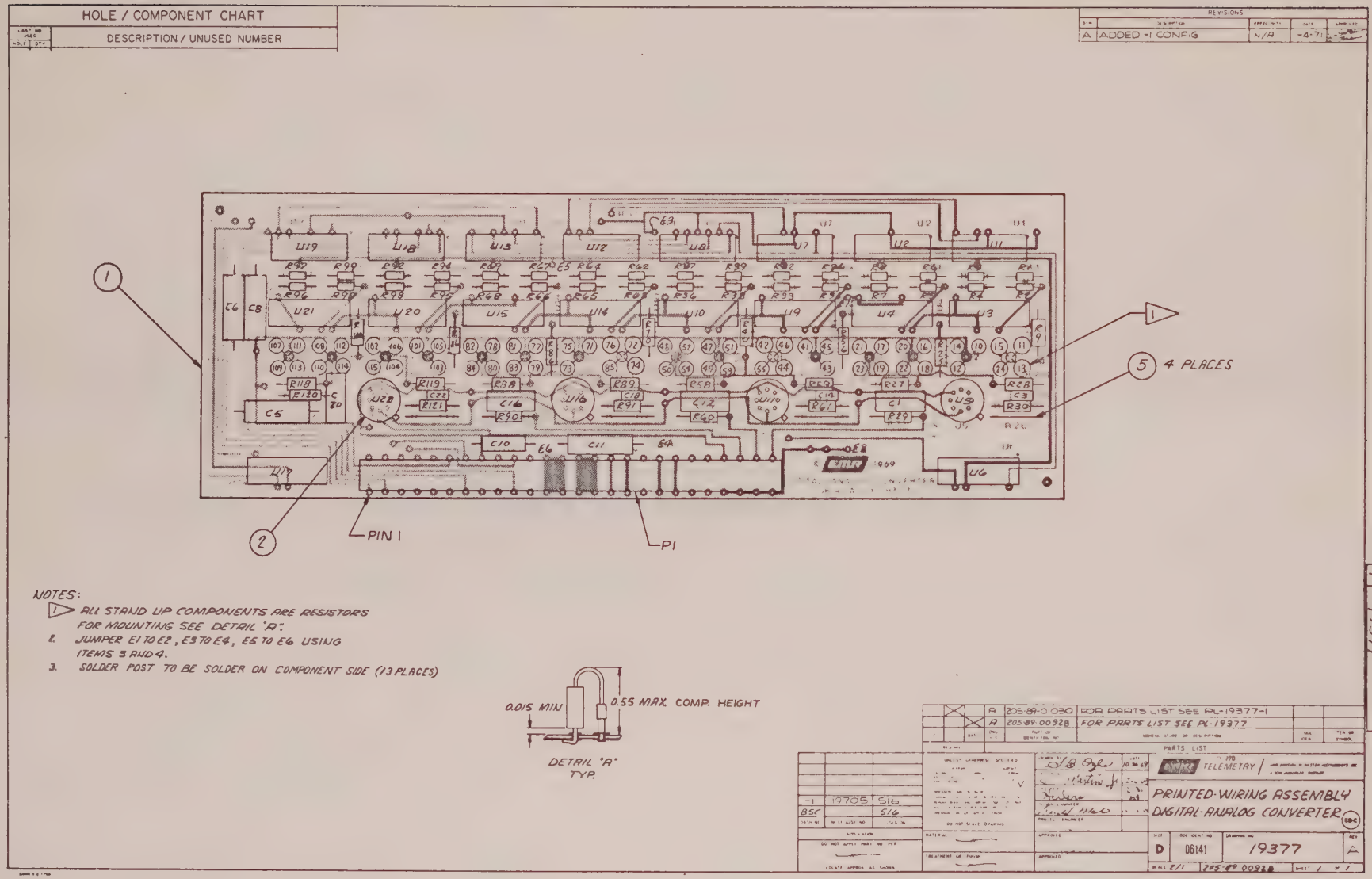


Figure 5-3. DAC Card (J2 through J9) Assembly Diagram

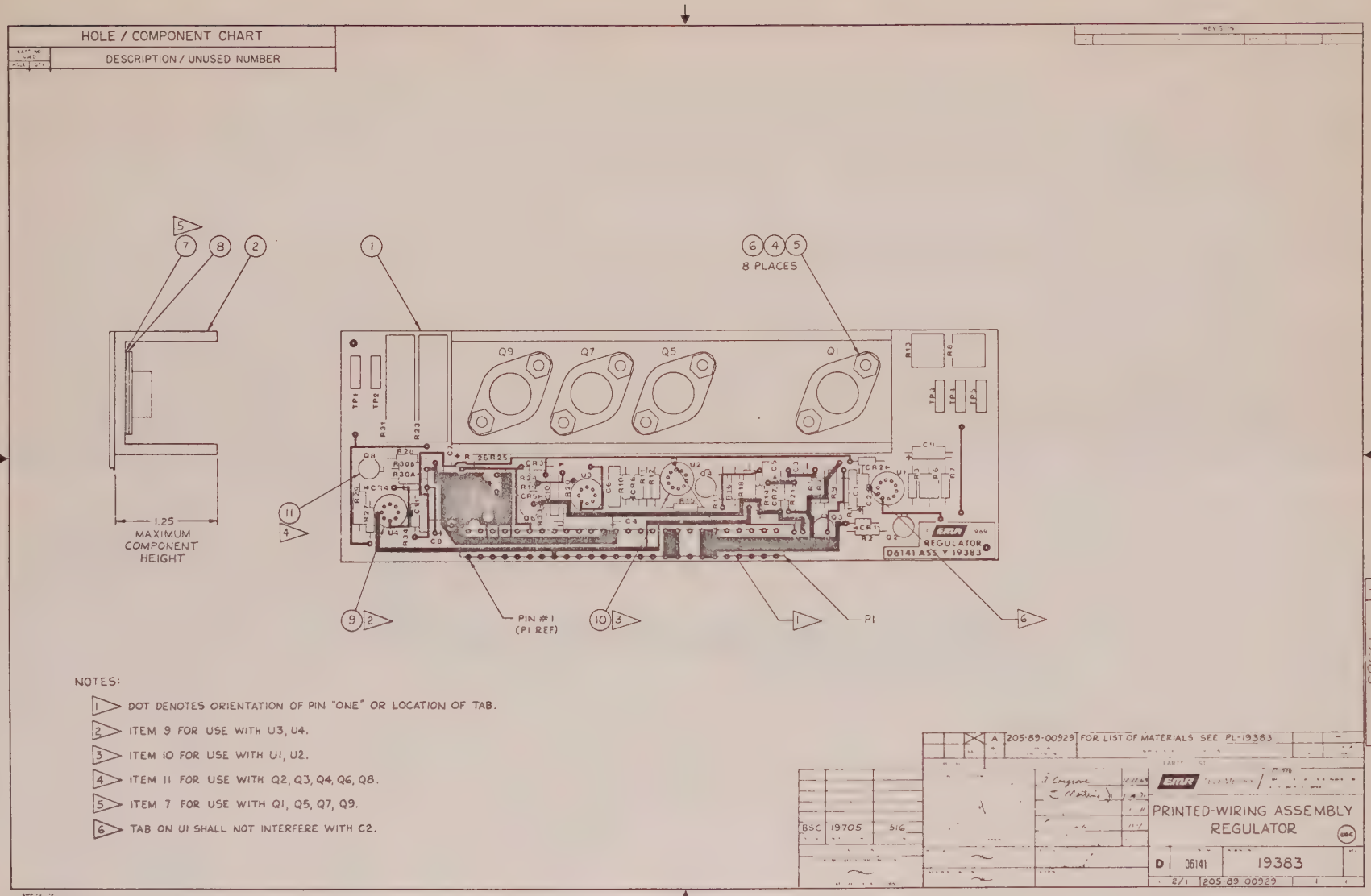


Figure 5-4. Regulator Card (J10) Assembly Diagram

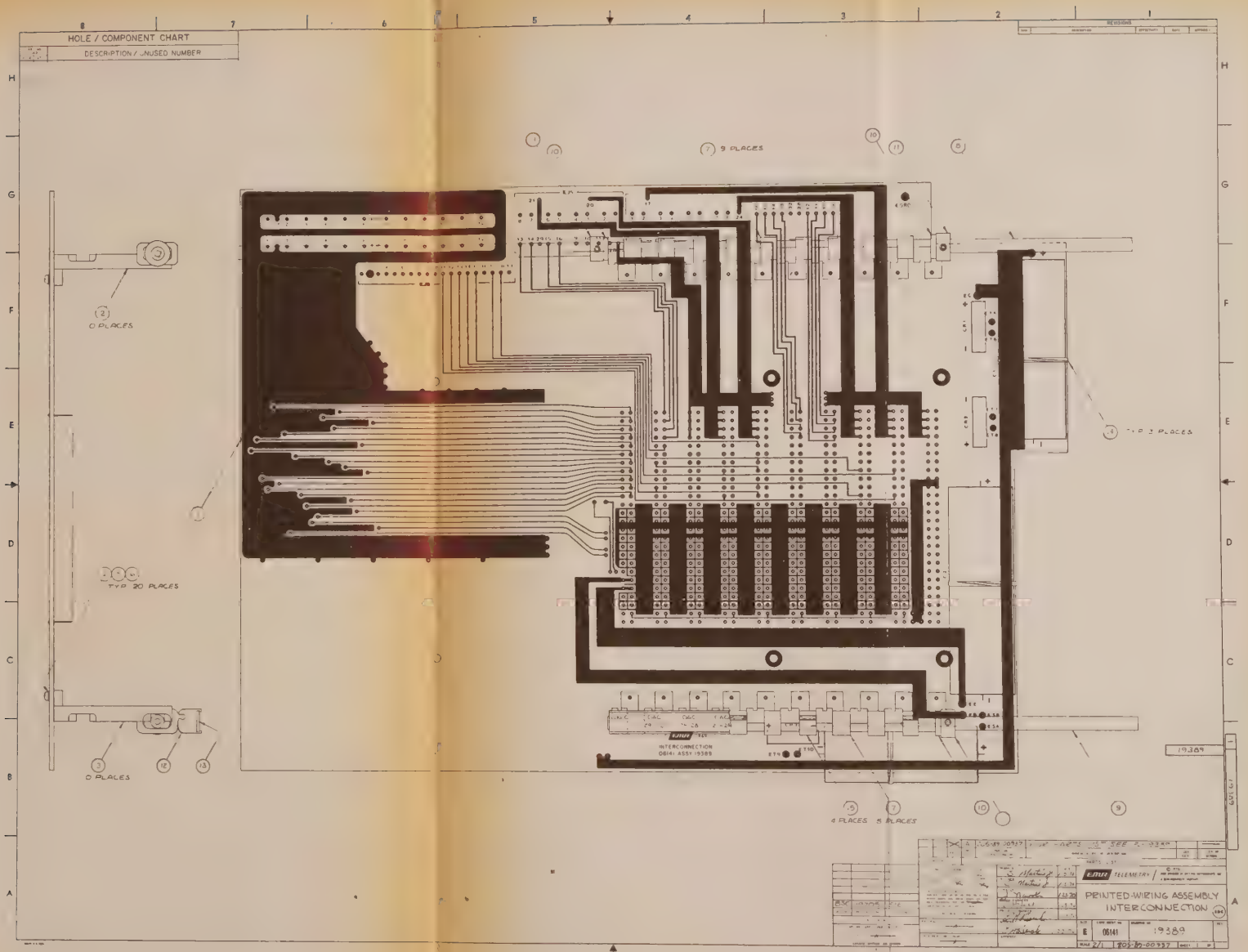


FIGURE 5-5 INTERCONNECTION BOARD ASSEMBLY DIAGRAM

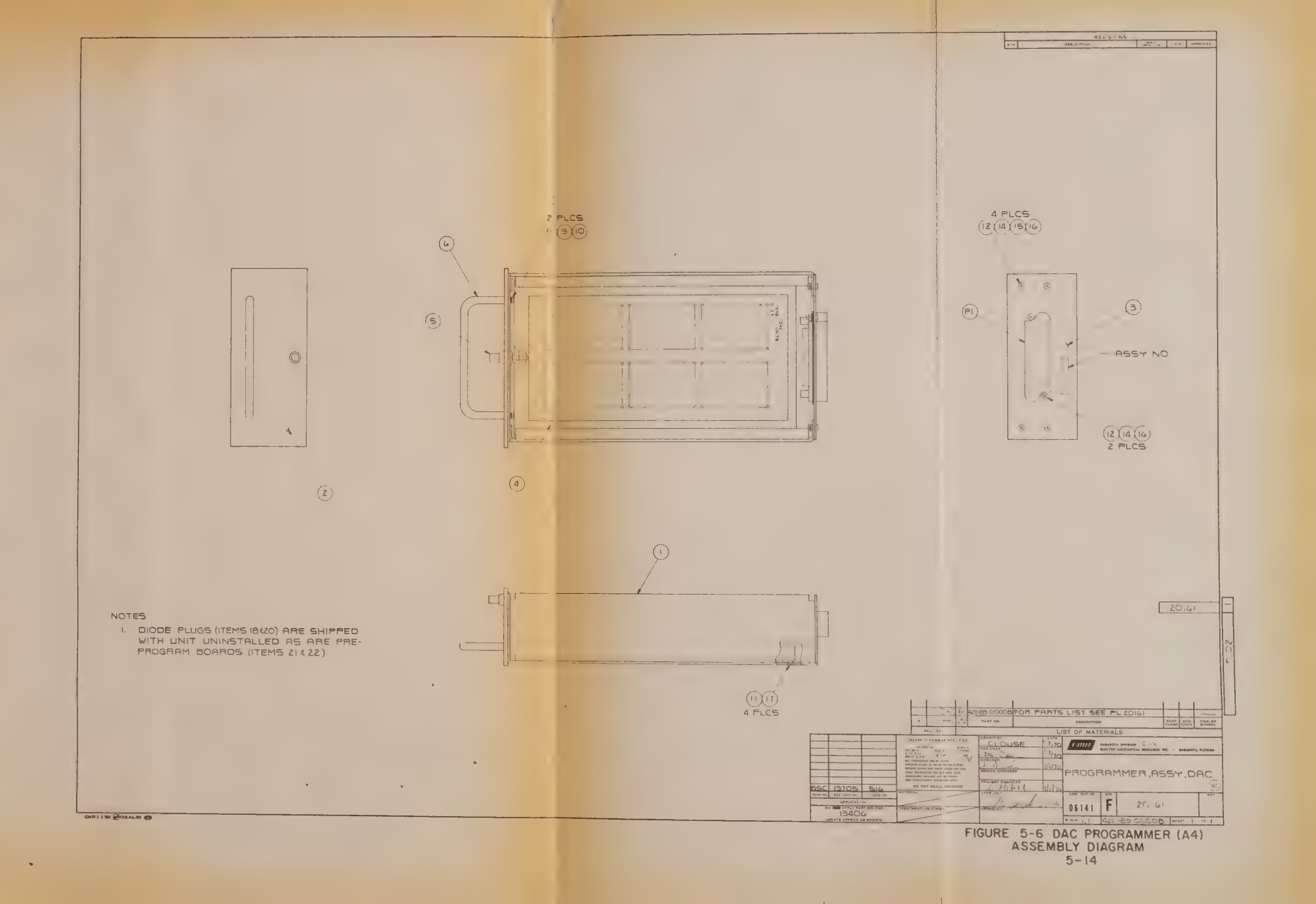
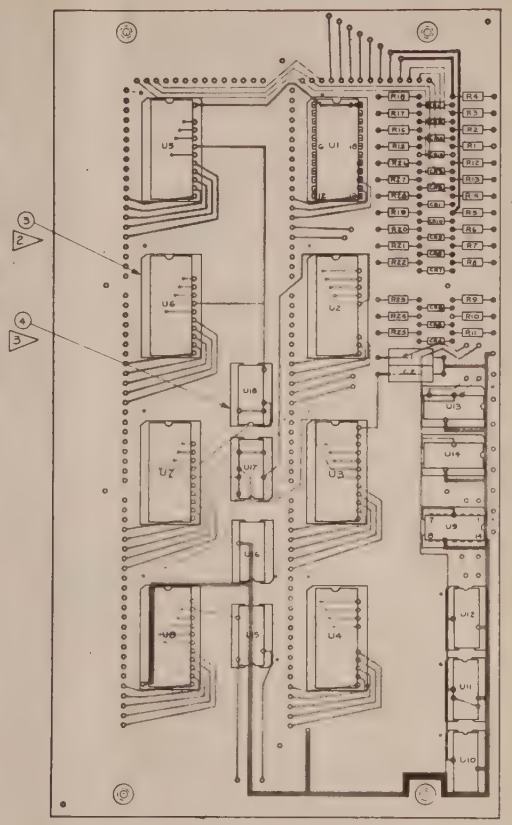


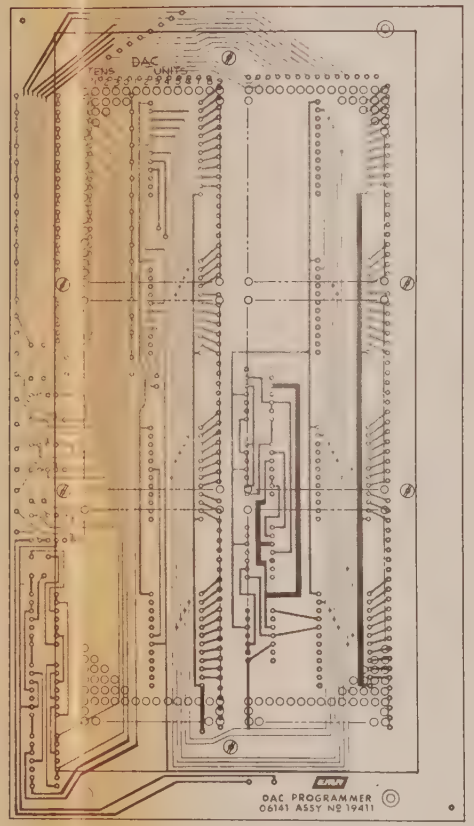
FIGURE 5-6 DAC PROGRAMMER (A4) ASSEMBLY DIAGRAM

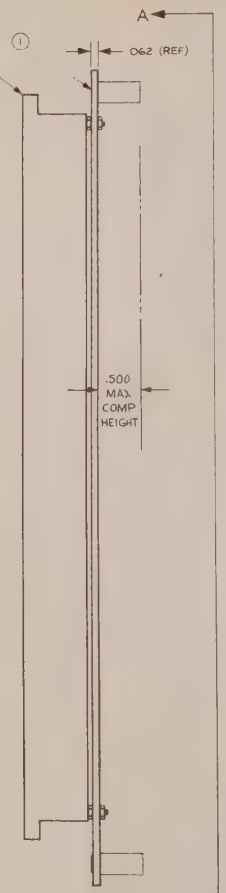


VIEW AA

NOTES:

1. MOUNTING HARDWARE SUPPLIED BY VENDOR.
2. ITEM 3 USED WITH U1 THRU U8.
3. ITEM 4 USED WITH U9 THRU U18.





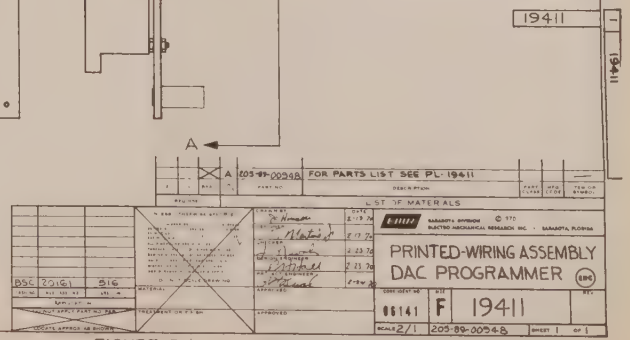
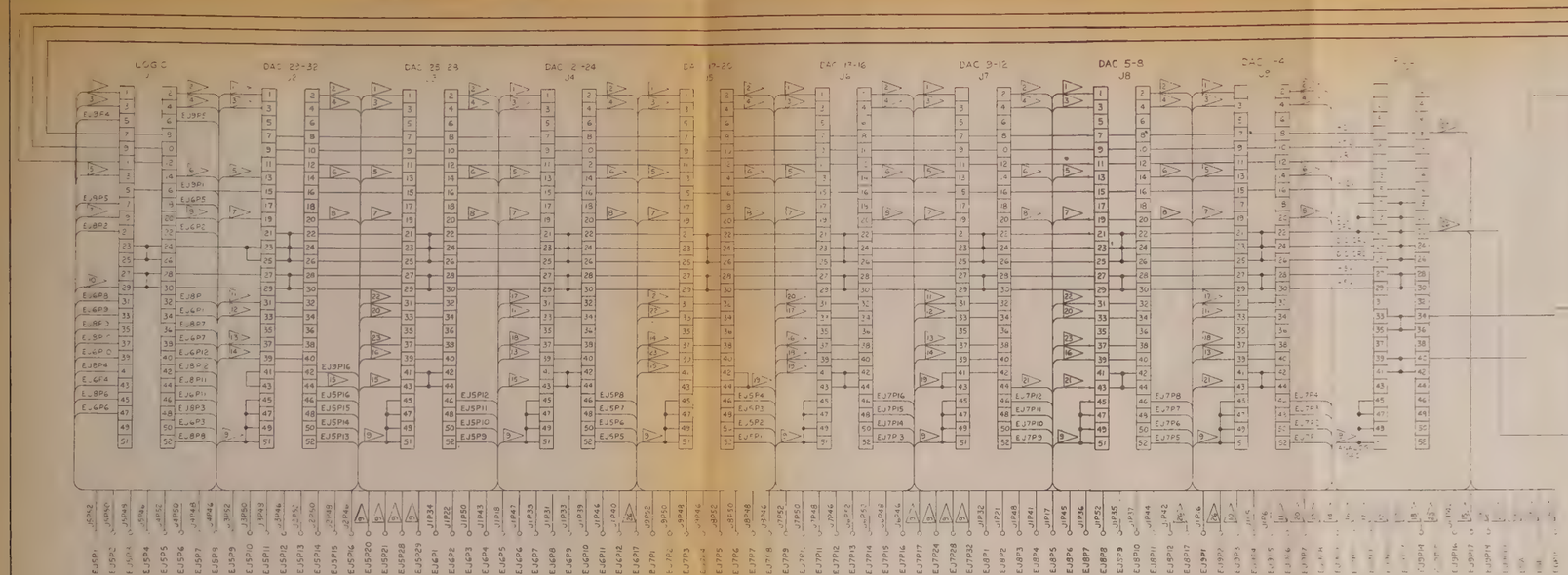


FIGURE 5-7 DAC PROGRAMMER PRINTED-WIRING BOARD ASSEMBLY DIAGRAM



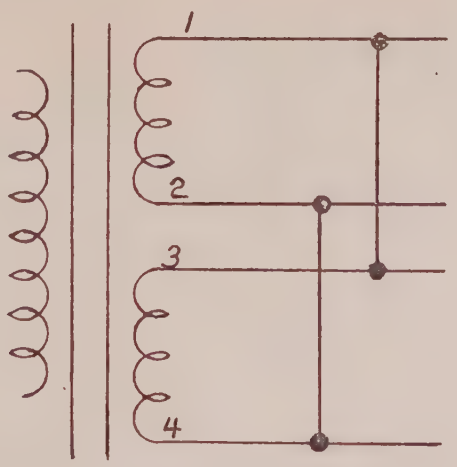
NOTES:

1. J1P1, J2P1, J3P1, J4P1, J5P1, J6P1, J7P1, J8P1, J9P1
2. J1P2, J2P2, J3P2, J4P2, J5P2, J6PC, J7P2, J8P2, J9P2
3. J1P3, J2P3, J3P3, J4P3, J5P3, J6P3, J7P3, J8P3, J9P3
4. J1P4, J2P4, J3P4, J4P4, J5P4, J6P4, J7P4, J8P4, J9P4
5. J1P13, J2P13, J3P13, J4P13, J5P13, J6P13, J7P13, J8P13, J9P13
6. J1P14, J2P14, J3P14, J4P14, J5P14, J6P14, J7P14, J8P14, J9P14
7. J1P19, J2P19, J3P19, J4P19, J5P19, J6P19, J7P19, J8P19, J9P19
8. J1P20, J2P20, J3P20, J4P20, J5P20, J6P20, J7P20, J8P20, J9P20
9. J2P51, J3P51, J4P51, J5P51, J6P51, J7P51, J8P51, J9P51, J10P51 EJ5P20, EJ5P21, EJ5P28, EJ5P23, EJ7P17, EJ7P24, EJ7P28, EJ7P32 (ANALOG GROUND)
10. EJ9P3 (+5V)
11. J2P31, J4P33, J7P31, J9P33, EJ9P6 (UNITS 2)
12. J2P33, J5P31, J7P33, EJ9P12 (UNITS 0)
13. J2P37, J4P39, J7P37, J9P39, EJ9P8 (UNITS 1)
14. J2P35, J5P37, J7P39, EJ9P3, (UNITS 9)
15. J2P44, J3P43, J4P43, J5P41, EJ9P17 (TENS 2)
16. J3P39, J6P37, J8P39, EJ9P10 (UNITS 5)
17. J4P31, J6P33, J9P31, EJ9P11 (UNITS 4)
18. J4P37, J6P39, J9P37, EJ9P14 (UNITS 3)
19. J5P42, J6P41, J7P43, EJ9P18 (TENS 1)
20. J9P33, J6P31, J8P33, EJ9P7 (UNITS 6)
21. J7P44, J8P41, J9P41, EJ9P19 (TENS 0)
22. J3P31, J5P33, J8P31, EJ9P13 (UNITS 8)
23. J3P37, J5P39, J8P37, EJ9P15 (UNITS 7)
24. Q1 NOT LOCATED ON INTERCONNECT BOARD
25. T1 NOT LOCATED ON INTERCONNECT BOARD
26. J10P22, EJ6P17, EJ8P17, EJ9P2, ESA, EGRD
27. J10P8, ESB

19387 J1

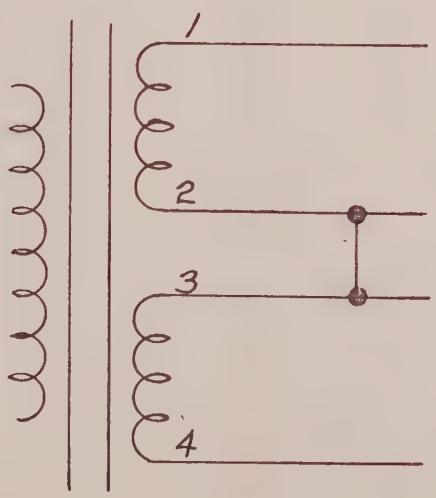
19387

FIGURE 5-8 INTERCONNECTION BOARD WIRING DIAGRAM 5-16



A

Connections for 105V to 130V Operation



B

Connections for 210V to 260V Operation

Figure 5-9. Power Transformer A1T1 Primary Winding Connection Diagram

Table 5-2. Model 516 Demultiplexer
Wire List

EMR Dwg. No. 20151 (12 Sheets), Rev. A.

REVISIONS				
SYM	DESCRIPTION	EFFECTIVITY	DATE	APPROVED
A	ECO 40591 CORRECT ERROR	1 & UP	6-15-70	

DRAWN BY		DATE	1-15-70
DESIGNER			1/15/70
CHECKER			1/15/70
DESIGN ENGINEER			1/15/70
PROJECT ENGINEER			1-15-70
APPROVED			1-15-70
APPROVED			

TELEMETRY / EMR DIVISION OF WESTON INSTRUMENTS, INC. A SCHLUMBERGER COMPANY

WIRE LIST
MODEL 516

SIZE	CODE IDENT NO.	DRAWING NO.	REV
A	06141	20151	A

SCALE X | 50-14-00208 | SHEET 1 OF 12

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A1ET5			A1T1P5			#24 Strd	W			15V AC 3.5A	
A1ET6			A1T1P6							15V AC RET.	
A1ET7			A1T1P7							26V AC 1A	
A1ET8			A1T1P8							26V AC RET.	
A1ET9			A1T1P9							26V AC 1A	
A1ET10			A1T1P10							26V AC RET.	
A1EE			A1Q1E							EMITTER Q1	
A1EB			A1Q1B							BASE Q1	
A1EC			A1Q1C							COL. Q1	
A1T1P2			*								
A1T1P3			*			#24 Strd	W				

* See Dwg. 19728 for 110 volt operation.
See Dwg. 19729 for 220 volt operation.

See Figure 5-9

A1 to A1

SIZE	CODE IDENT NO.	
A	06141	20151

SHEET 2

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A2S1P1			A2S1P5			#24 Strd	W			Power Sw. Connection	

	SIZE	CODE IDENT NO.	
A2 to A2	A	08141	20151
			SHEET 3

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A3J5P17			A3J5P18			#24 Solid	Buss			GND BUSS	
A3J5P18			A3J5P19								
A3J5P19			A3J5P20								
A3J5P21			A3J5P22								
A3J5P22			A3J5P23								
A3J5P23			A3J5P24								
A3J5P25			A3J5P26								
A3J5P26			A3J5P27								
A3J5P27			A3J5P28								
A3J5P29			A3J5P30								
A3J5P30			A3J5P31								
A3J5P31			A3J5P32								
A3J7P17			A3J7P18								
A3J7P18			A3J7P19								
A3J7P19			A3J7P20								
A3J7P21			A3J7P22								
A3J7P22			A3J7P23								
A3J7P23			A3J7P24								
A3J7P25			A3J7P26								
A3J7P26			A3J7P27								
A3J7P27			A3J7P28								
A3J7P29			A3J7P30								
A3J7P30			A3J7P31								
A3J7P31			A3J7P32			#24 Solid	Buss			GND BUSS	

A3 to A3

SIZE	CODE IDENT NO.	
A	06141	20151

SHEET 4

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A3J6P17			A3J6P18			#24 Solid	Buss			GND BUSS	
A3J6P18			A3J6P19								
A3J6P19			A3J6P20								
A3J6P20			A3J6P21								
A3J6P21			A3J6P22								
A3J6P22			A3J6P23								
A3J6P23			A3J6P24								
A3J6P24			A3J6P25								
A3J6P25			A3J6P26								
A3J6P26			A3J6P27								
A3J6P27			A3J6P28								
A3J8P17			A3J8P18								
A3J8P18			A3J8P19								
A3J8P19			A3J8P20								
A3J8P20			A3J8P21								
A3J8P21			A3J8P22								
A3J8P22			A3J8P23								
A3J8P23			A3J8P24								
A3J8P24			A3J8P25								
A3J8P25			A3J8P26								
A3J8P26			A3J8P27								
A3J8P27			A3J8P28			#24 Solid	Buss			GND BUSS	
A3P1PW			A3J2			#24 Strd	W			CHASSIS GND	
A3P1PY			A3F1P1			#24 Strd	W			A-C POWER	

A3 to A3

SIZE	CODE IDENT NO.		REV.
A	06141	20151	A

SHEET 5

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A3P1PX			A3B1P2			#24 Strd	W			A-C POWER TO FAN	

	SIZE	CODE IDENT NO.	
A3 to A3	A	06141	20151
			SHEET 6

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A1T1P1			A2S1P6			#24 Strd	W			A-C POWER	
A1ESA			A2S1PA							POWER SW. LAMP	
A1ESB			A2S1PB			#24 Strd	W			POWER SW. LAMP	

END

	SIZE	CODE IDENT NO.	
A1 to A2	A	06141	20151
			SHEET 7

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A1T1P4			A3P1PX			#24 Strd	W			A-C POWER	
A1EJ5P1			A3J5P1							DAC 17 OUT	
A1EJ5P2			A3J5P2							DAC 18 OUT	
A1EJ5P3			A3J5P3							DAC 19 OUT	
A1EJ5P4			A3J5P4							DAC 20 OUT	
A1EJ5P5			A3J5P5							DAC 21 OUT	
A1EJ5P6			A3J5P6							DAC 22 OUT	
A1EJ5P7			A3J5P7							DAC 23 OUT	
A1EJ5P8			A3J5P8							DAC 24 OUT	
A1EJ5P9			A3J5P9							DAC 25 OUT	
A1EJ5P10			A3J5P10							DAC 26 OUT	
A1EJ5P11			A3J5P11							DAC 27 OUT	
A1EJ5P12			A3J5P12							DAC 28 OUT	
A1EJ5P13			A3J5P13							DAC 29 OUT	
A1EJ5P14			A3J5P14							DAC 30 OUT	
A1EJ5P15			A3J5P15							DAC 31 OUT	
A1EJ5P16			A3J5P16							DAC 32 OUT	
A1EJ5P20			A3J5P20							ANA. GND DAC 17→20	
A1EJ5P21			A3J5P21							ANA. GND DAC 21→24	
A1EJ5P28			A3J5P28							ANA. GND DAC 25→28	
A1EJ5P29			A3J5P29							ANA. GND DAC 29→32	
A1EJ6P1			A3J6P1							INPUT BIT 1	
A1EJ6P2			A3J6P2							INPUT BIT 2	
A1EJ6P3			A3J6P3			#24	W			INPUT BIT 3	

A1 to A3

SIZE	CODE IDENT NO.	
A	06141	20151

SHEET 8

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A1EJ6P4			A3J6P4			#24 Strd	W			INPUT BIT 4	
A1EJ6P5			A3J6P5							INPUT BIT 5	
A1EJ6P6			A3J6P6							INPUT BIT 6	
A1EJ6P7			A3J6P7							INPUT BIT 7	
A1EJ6P8			A3J6P8							INPUT BIT 8	
A1EJ6P9			A3J6P9							INPUT BIT 9	
A1EJ6P10			A3J6P10							INPUT BIT 10	
A1EJ6P11			A3J6P11							INPUT FR. RATE	
A1EJ6P12			A3J6P12							INPUT CH. RATE	
A1EJ6P17			A3J6P17							DIG. GND FOR INPUTS	
A1EJ7P1			A3J7P1							OUTPUT DAC 1	
A1EJ7P2			A3J7P2							OUTPUT DAC 2	
A1EJ7P3			A3J7P3							OUTPUT DAC 3	
A1EJ7P4			A3J7P4							OUTPUT DAC 4	
A1EJ7P5			A3J7P5							OUTPUT DAC 5	
A1EJ7P6			A3J7P6							OUTPUT DAC 6	
A1EJ7P7			A3J7P7							OUTPUT DAC 7	
A1EJ7P8			A3J7P8							OUTPUT DAC 8	
A1EJ7P9			A3J7P9							OUTPUT DAC 9	
A1EJ7P10			A3J7P10							OUTPUT DAC 10	
A1EJ7P11			A3J7P11							OUTPUT DAC 11	
A1EJ7P12			A3J7P12							OUTPUT DAC 12	
A1EJ7P13			A3J7P13							OUTPUT DAC 13	
A1EJ7P14			A3J7P14			#24 Strd	W			OUT DAC 14	

A1 to A3

SIZE	CODE IDENT NO.	
A	06141	20151

SHEET 9

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A1EJ7P15			A3J7P15			#24 Strd	W			OUTPUT DAC 15	
A1EJ7P16			A3J7P16							OUTPUT DAC 16	
A1EJ7P17			A3J7P17							ANA. GND DAC 1→4	
A1EJ7P24			A3J7P24							ANA. GND DAC 5→8	
A1EJ7P28			A3J7P28							ANA. GND DAC 9→12	
A1EJ7P32			A3J7P32							ANA. GND DAC 13→16	
A1EJ8P1			A3J8P1							OUTPUT BIT 1	
A1EJ8P2			A3J8P2							OUTPUT BIT 2	
A1EJ8P3			A3J8P3							OUTPUT BIT 3	
A1EJ8P4			A3J8P4							OUTPUT BIT 4	
A1EJ8P5			A3J8P5							OUTPUT BIT 5	
A1EJ8P6			A3J8P6							OUTPUT BIT 6	
A1EJ8P7			A3J8P7							OUTPUT BIT 7	
A1EJ8P8			A3J8P8							OUTPUT BIT 8	
A1EJ8P9			A3J8P9							OUTPUT BIT 9	
A1EJ8P10			A3J8P10							OUTPUT BIT 10	
A1EJ8P11			A3J8P11							OUTPUT ER. RATE	
A1EJ8P12			A3J8P12							OUTPUT CH. RATE	
A1EJ8P17			A3J8P17							DIG. GND. FOR OUTPUT	
A1EGRD			A3J1			#24 Strd	W			SYSTEM GND	

	SIZE	CODE IDENT NO.		REV.
A1 to A3	A	06141	20151	A
			SHEET 10	

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A1EJ9P1			A4J9P1			#24 Strd	W			-12V IN	
A1EJ9P2			A4J9P2							DIG GND	
A1EJ9P3			A4J9P3							+5V IN	
A1EJ9P4			A4J9P4							CCTR	
A1EJ9P5			A4J9P5							RCTR	
A1EJ9P6			A4J9P6							UNITS 2 OUT	
A1EJ9P7			A4J9P7							UNITS 6 OUT	
A1EJ9P8			A4J9P8							UNITS 1 OUT	
A1EJ9P9			A4J9P9							UNITS 9 OUT	
A1EJ9P10			A4J9P10							UNITS 5 OUT	
A1EJ9P11			A4J9P11							UNITS 4 OUT	
A1EJ9P12			A4J9P12							UNITS 0 OUT	
A1EJ9P13			A4J9P13							UNITS 8 OUT	
A1EJ9P14			A4J9P14							UNITS 3 OUT	
A1EJ9P15			A4J9P15							UNITS 7 OUT	
A1EJ9P16			A4J9P16							TENS 3 OUT	
A1EJ9P17			A4J9P17							TENS 2 OUT	
A1EJ9P18			A4J9P18							TENS 1 OUT	
A1EJ9P19			A4J9P19			#24 Strd	W			TENS 0 OUT	

A1 to A4

SIZE	CODE IDENT NO.	
A	06141	20151

SHEET 11

FROM	TERM TYPE	ASSY CODE	TO	TERM TYPE	ASSY CODE	WIRE	COLOR	LENGTH	WIRE NO.	FUNCTION	REV
A2S1P5			A3F1P2			#24 Strd	W			A-C POWER	
A2S1P2			A3B1P1			#24 Strd	W			A-C POWER TO FAN	

	SIZE	CODE IDENT NO.	
A2 to A3	A	06141	20151
			SHEET 12

Table 5-3. Input/Output Connectors
Pin/Function List

EMR Dwg. 20152 (5 Sheets), Rev. ___

REVISIONS				
SYM	DESCRIPTION	EFFECTIVITY	DATE	APPROVED

DRAWN BY		DATE	
DESIGNER			
CHECKER		11/24/70	
DESIGN ENGINEER		1-28-70	
PROJECT ENGINEER		1-28-70	
APPROVED		1-24-70	
APPROVED			

EMR TELEMETRY

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A SCHLUMBERGER COMPANY

INPUT/OUTPUT CONNECTOR LIST
MODEL 516

EDO

SIZE	CODE IDENT NO.	DRAWING NO.	REV
A	06141	20152	

SCALE -1- | 535-25-00042 | SHEET 1 OF 5

Connector A3J6 DIGITAL DATA INPUTS

PIN NO.	SIGNAL		
1	PDO 1 (MSB)		
17	GND		
2	PDO 2		
18	GND		
3	PDO 3		
19	GND		
4	PDO 4		
20	GND		
5	PDO 5		
21	GND		
6	PDO 6		
22	GND		
7	PDO 7		
23	GND		
8	PDO 8		
24	GND		
9	PDO 9		
25	GND		
10	PDO 10		
26	GND		
11	FRAME RATE		
27	GND		
12	CHANNEL RATE		
28	GND		
13	SPARE		
29			
14			
30			
15			
31			
16			
32	SPARE		

CODE IDENT NO.	SIZE	
06141	A	20152
SCALE —		SHEET 2

Connector A3J8 DIGITAL DATA OUTPUTS

PIN NO.	SIGNAL		
1	PDO 1 (MSB)		
17	GND		
2	PDO 2		
18	GND		
3	PDO 3		
19	GND		
4	PDO 4		
20	GND		
5	PDO 5		
21	GND		
6	PDO 6		
22	GND		
7	PDO 7		
23	GND		
8	PDO 8		
24	GND		
9	PDO 9		
25	GND		
10	PDO 10		
26	GND		
11	FRAME RATE		
27	GND		
12	CHANNEL RATE		
28	GND		
13	SPARE		
29	↑		
14	|		
30	|		
15	|		
31	|		
16	↓		
32	SPARE		

CODE IDENT NO.	SIZE	
06141	A	20152
SCALE —		SHEET 3

R 3/2/24 [illegible] (+)

Connector A3J7 DAC 1 - 16 OUTPUTS

PIN	SIGNAL		
1	DAC 1 OUTPUT		
17	GND		
2	DAC 2 OUTPUT		
18	GND		
3	DAC 3 OUTPUT		
19	GND		
4	DAC 4 OUTPUT		
20	GND		
5	DAC 5 OUTPUT		
21	GND		
6	DAC 6 OUTPUT		
22	GND		
7	DAC 7 OUTPUT		
23	GND		
8	DAC 8 OUTPUT		
24	GND		
9	DAC 9 OUTPUT		
25	GND		
10	DAC 10 OUTPUT		
26	GND		
11	DAC 11 OUTPUT		
27	GND		
12	DAC 12 OUTPUT		
28	GND		
13	DAC 13 OUTPUT		
29	GND		
14	DAC 14 OUTPUT		
30	GND		
15	DAC 15 OUTPUT		
31	GND		
16	DAC 16 OUTPUT		
32	GND		

CODE IDENT NO.	SIZE	
06141	A	20152
SCALE —/—		SHEET 4

Connector A3J5 DAC 17 - 32 OUTPUTS

PIN	SIGNAL		
1	DAC 17 OUTPUT		
17	GND		
2	DAC 18 OUTPUT		
18	GND		
3	DAC 19 OUTPUT		
19	GND		
4	DAC 20 OUTPUT		
20	GND		
5	DAC 21 OUTPUT		
21	GND		
6	DAC 22 OUTPUT		
22	GND		
7	DAC 23 OUTPUT		
23	GND		
8	DAC 24 OUTPUT		
24	GND		
9	DAC 25 OUTPUT		
25	GND		
10	DAC 26 OUTPUT		
26	GND		
11	DAC 27 OUTPUT		
27	GND		
12	DAC 28 OUTPUT		
28	GND		
13	DAC 29 OUTPUT		
29	GND		
14	DAC 30 OUTPUT		
30	GND		
15	DAC 31 OUTPUT		
31	GND		
16	DAC 32 OUTPUT		
32	GND		

SECTION 6

PARTS LISTS AND RECOMMENDED SPARES

6.1 GENERAL

This section contains information concerning parts replacement, spares provisioning, and parts ordering information for the EMR Model 516 Demultiplexer Assembly. Paragraph 6.2 describes the parts breakdown for the Model 516 as provided in this manual. Recommended spares, spares provisioning information, and parts ordering instructions are contained in paragraphs 6.3, 6.4, and 6.5, respectively.

6.2 PARTS LIST DESCRIPTION

Table 6-1 identifies the individual parts lists provided in this section for the Model 516 Demultiplexer Assembly and references the appropriate assembly diagram for each list. Table 6-2 contains the top-level parts breakdown for the Model 516. This breakdown lists all components mounted directly to the chassis of the Model 516 and its individual subassemblies. Subsequent parts list tables, as identified in Tables 6-1 and 6-2, provide detailed component breakdowns of the subassemblies.

The parts list for each assembly contains a listing of all subassemblies and components of the assembly. These subassemblies and/or components are identified by an item number in the ITEM NO. column. The item numbers (or component designation) correspond to numbers in the reference balloons on the associated EMR drawing. Also included in the parts list for each item are the quantity required (QTY REQ'D), EMR PART NUMBER, EMR DRAWING or SPEC. NO., item DESCRIPTION, VENDOR NAME, and VENDOR PART NUMBER.

The listings in the VENDOR NAME column are abbreviations for the particular vendors. These abbreviations and complete vendor identification are contained in Table 6-9.

6.3 RECOMMENDED SPARES

A list of the recommended spare parts for the Model 516 is contained in Table 6-10. The recommended spares as listed in this table are based on the following conditions:

a. Operating Time -- 8 hours/day, 5 days/week (2080 hours/year)

b. Operating Temperature -- 0°C to 50°C

c. User has capability to repair to the component level.

d. Failure rates are constant.

e. A 0.9 probability of being able to repair from the recommended complement for one year.

f. Equipment will be used as ground equipment (as opposed to vehicular or airborne).

The recommended spares table contains a PART DESCRIPTION column, an EMR STOCK NO. column, a VENDOR NAME column, a VENDOR PART NO. column, a TQ column which is the total quantity of the part in the unit, and an RS column which lists the number of recommended spares for the part. The listings in the VENDOR NAME column are abbreviations for the particular vendors. These abbreviations and complete vendor identification are described in Table 6-9.

6.4 PROVISIONING CONSIDERATIONS

The selection of an optimum spare parts complement involves a number of considerations known only to the user. These considerations include operating time and cycles, operating environment, number of equipments to be spared and their locations with respect to one another, urgency of returning an equipment to service, troubleshooting, repair and test capability, stock of commonly used parts, etc.

Sparing considerations known to EMR include mean-time-between-failures for parts and assemblies under various operating environments, prices, relative ease of troubleshooting, repair, retest, etc.

Table 6-11 lists the type of information required in order for EMR to recommend an optimum spare parts complement for specific operating and logistic situations.

If the information outlined in Table 6-11 is supplied to EMR, a recommended list will be furnished at no cost for each individual situation.

6.5 ORDERING INSTRUCTIONS

When ordering parts, complete description of each part as listed in DESCRIPTION column of parts list must accompany order. Also included, must be EMR stock number and vendor's name and part number.

Table 6-1. Parts List Identification

ITEM	TABLE NO.	FIGURE NO.
MODEL 516 DEMULTIPLEXER ASSEMBLY	6-2	5-1
Interconnection Board Printed-Wiring Assembly	6-3	5-5
Logic Board Printed-Wiring Assembly (Card 1)	6-4	5-2
Digital-to-Analog Converter Board Printed-Wiring Assembly 19377 (Cards 2 through 9). Used in ±5-volt units.	6-5	5-3
Digital-to-Analog Converter Board Printed-Wiring Assembly 19377-1 (Cards 2 through 9). Used in 0-volt to +10-volt units.	6-5A	5-3
Regulator Board Printed-Wiring Assembly (Card 10)	6-6	5-4
DAC Programmer (A4) Assembly	6-7	5-6
DAC Programmer Printed-Wiring Board Assembly	6-8	5-7

Table 6-2

PARTS LIST 19705 REV DATE 02/22/71 REV LTR F

LIST TITLE DEMXR,ASSY CHGE CONT NO. CODE IDENT SHT 1 OF 4
PART NO. 179-89-00009 ECO 41968 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	042-89-00154	19707	CHAS,ASSY	EMR	042-89-00154
2	1	282-99-00047	10521	RAIL,SIDE,LEFT	EMR	282-99-00047
3	1	282-99-00048	10521-1	RAIL,SIDE,RIGHT	EMR	282-99-00048
4	1	191-89-00408	19706	PANEL,ASSY FRONT	EMR	191-89-00408
5	1	298-99-00024	19704	HTSK,TO-3 3LX2.4WX.935H	EMR	298-99-00024
6	2	128-99-00030	10530	HANDLE	EMR	128-99-00030
7	1	075-89-00064	10522-1	COVER,ASSY	EMR	075-89-00064
8	1	196-99-00160	10654	PLATE,TERMINAL COVER	EMR	196-99-00160
9	1	136-89-00008	10671	HSG,ASSY,CHAS	EMR	136-89-00008
10	1	420-89-00008	20161	PROGMR,ASSY,DAC	EMR	420-89-00008
11	2	140-99-00117	19717-1	INSUL,CHAS	EMR	140-99-00117
12	2	140-99-00119	19718	INSUL,CHAS	EMR	140-99-00119
13	1	140-99-00116	19717	INSUL,CHAS	EMR	140-99-00116
14	1	196-99-00156	10663	PLATE,NAME EQUIP IDENT	EMR	196-99-00156
15	1	024-89-00048	10672	CABLE ASSY,INTER	EMR	024-89-00048
17	2	239-98-00018		SPACER,#4,.250 OD,.500LG	TRI-TECH	BY DESCRIPTION
18	A/R	273-02-00005		WASHER,#4, FLT ST STL	QVL	MS15795-804
19	A/R	273-02-00007		WASHER,#6, FLT ST STL	QVL	MS15795-806
21	A/R	273-02-00025		WASHER,#4,INT TOOTH	QVL	MS35333-70
22	A/R	273-02-00026		WASHER,#6,INT TOOTH	QVL	MS35333-71
23	A/R	273-02-00027		WASHER,#8,INT TOOTH	QVL	MS35333-72
24	A/R	273-02-00028		WASHER,#10,INT TOOTH	QVL	MS35333-73

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ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
25	A/R	273-98-00022		WASHER,FIBER,#6 FLAT	GEN CEMENT	6513
26	2	022-98-00003		BUSH., SHOULDER	DEL BLINN	NY-04-090
27	1	140-98-00006		INS,MICA WASHER TO-3 XSTR	SPR PIN MICA	120
28	A/R	060-21-00002		COMP,HEAT SINK	DOW CORNING	#340
29	1	016-99-00042	11977	BRKT, SWITCH MOUNTING	EMR	016-99-00042
31	2	239-98-00030		SPACER,1/4DX1/8L,#6	AMATOM	9222-PH-140
32	1	255-98-00048		TERM, SOLDER LUG, #4	BIRNBACK	193
34	2	229-98-00120		SCREW,CAPTIVE PANEL	AMATOM	6141-SS-1032
35	A/R	287-02-00002		NUT,HEX, 4-40	QVL	MS35649-244
36	A/R	287-02-00003		NUT,HEX, 6-32	QVL	MS35649-264
37	1	999-01-00002	10674	PLATE WARNING *POA VAR*		
38	A/R	229-98-00056		SCREW,10-32X1/2,PAN HD	QVL	BY DESCRIPTION
39	1	070-98-00016		CORD,W/PLUG,8FT,SJ RUBBER	BELDEN	17408SJ
40	1	063-98-00024		CONN,PLUG,3-WIRE	HUBBELL	7484
41	1	126-98-00002		GRILLE,FOR SPRITE FAN	ROTRON	20049
42	A/R	999-05-00001	10674	SLIDES *PCA VAR*		
43	A/R	060-11-00002		COMP, LOCTITE, TYPE H	AMER SEALANT	BY DESCRIPTION
44	2	229-02-00190		SCREW,4-40X5/8,FLT HD	QVL	MS51959-18
45	2	239-98-00021		SPACER,5/16DX7/16L,#4	AMATOM	9289-SS115-7
46	A/R	229-02-00053		SCREW,6-32X1/2 OVAL HEAD	QVL	QQ-6-320A CL 1,TYPE 1
47	A/R	229-02-00074		SCREW,4-40X5/16 PAN HD	QVL	MS51957-14
48	A/R	229-02-00239		SCREW,4-40X1-1/4 PAN HD	QVL	MS51957-22
49	A/R	229-02-00084		SCREW,6-32X5/16 PAN HD	QVL	MS51957-27
50	A/R	229-02-00085		SCREW,6-32X3/8 PAN HD	QVL	MS51957-28

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ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
51	A/R	229-02-00088		SCREW,6-32X5/8 PAN HD	QVL	MS51957-31
52	A/R	229-02-00101		SCREW,8-32X7/16 PAN HD	QVL	MS51957-44
53	A/R	229-98-00056		SCREW,10-32X1/2,PAN HD	QVL	BY DESCRIPTION
54	A/R	229-02-00080		SCREW,4-40X7/8 PAN HD	QVL	MS51957-20
55	A/R	229-02-00075		SCREW,4-40X3/8 PAN HD	QVL	MS51957-15
56	A/R	229-02-00077		SCREW,4-40X1/2 PAN HD	QVL	MS51957-17
57	2	063-98-00165		CONN,PLUG, 32 CONTACT R&P	AMPHENOL	26-4301-32P
58	1	205-89-00937	19389	PWA, INTERCONNECTION	EMR	205-89-00937
59	1	205-89-00929	19383	PWA,REGULATOR	EMR	205-89-00929
60	A/R	999-02-00001	10674	PWA,DAC*PCA VAR*		
61	1	205-89-00930	19380	PWA,LOGIC BOARD	EMR	205-89-00930
62	1	205-89-00889	11073	PWA,EXTENDER CARD	EMR	205-89-00889
63	A/R	229-02-00187		SCREW,4-40X3/8,FLT HD	QVL	MS51959-15
64	A/R	276-98-00102		WIRE,#24,STRD,WHT,600V	QVL	NAS-703-24-U-C-9
65	A/R	276-99-00009	619-24	WIRE,#24,BUSS,SOLID	EMR	276-99-00009
66	1	140-99-00124	19716	INSUL	EMR	140-99-00124
67	A/R	999-04-00001	10674	RETRACTOR *PCA VAR*		
68	A/R	273-02-00011		WASHER,#10, FLT ST STL	QVL	NAS620C10
B 1	1	014-98-00006		BLOWER,FAN 115V,50/60 HZ	ROTRON	SP2A2
DS 1	1	151-02-00001		LAMP,T-1-3/4 28V,.04A	QVL	MS25237-327
F 1	1	999-01-00001	10674	FUSE *PCA VAR*		
J 1	1	200-98-00001		POST, BINDING BLACK INSUL	SUPERIOR	DF-308C
J 2	1	200-98-00003		POST, BINDING, GROUNDED	SUPERIOR	GP-30NC
J 5 THRU J 8	4	063-98-00166		CONN,RECP,32 CONTACT R&P	AMPHENOL	26-4401-32S

ITEM NO.		QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
P	1	1	063-98-00021		CONN,RECP,3-WIRE	HUBBELL	#7486
Q	1	1	263-10-30550		XSTR,NPN 15A SW-AMPL 100V	JEDEC	2N3055
S	1	1	250-98-00044		SWITCH,PUSHBUTTON, LITED	PENDAR	1160A7L56W1-L
T	1	1	262-99-00103	18916	XFMR	EMR	262-99-00103
XF	1	1	134-98-00006		HOLDER,FUSE .25 X 1.25	LITTLEFUSE	342004 OR 342028
A3C	1	1	304-41-56009	600	CAP. 560PF 1% 300V	EMR	304-41-56009
A3C	2	1	304-41-56009	600	CAP. 560PF 1% 300V	EMR	304-41-56009
A4C	1	1	304-20-15009	600	CAP. 150PF 1% 500V	EMR	304-20-15009
A4C	2	1	304-20-15009	600	CAP. 150PF 1% 500V	EMR	304-20-15009
REF	1	1	999-01-00003	10674	WIRING DIAGRAM,PS*POA VAR		
REF	2	1	905-05-00194	10049	VARIABLE CHART MOD 2758	EMR	905-05-00194
REF	3	1	905-14-00208	20151	WIRING LIST	EMR	905-14-00208
REF	4	1	905-25-00042	20152	I/C CONN TABLE	EMR	905-25-00042
REF	5	1	905-07-00154	17547	SPEC,ENG,MODEL 516	EMR	905-07-00154
REF	6	1	197-89-00001	20165	PKG SYS,ASSY,500-SERIES	EMR	197-89-00001
REF	7	1	905-06-00132	19984	SPEC,TEST,SYSTEM MOD 516	EMR	905-06-00132

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Table 6-3

PARTS LIST 19389 REV DATE 05/01/70 REV LTR A

LIST TITLE PWA, INTERCONNECTION CHGE CONT NO. CODE IDENT SHT 1 OF 1
PART NO. 205-89-00937 ECO 39983 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-89-00353	19388	PWB,INTERCONNECTION	EMR	204-89-00353
2	10	401-98-00006		GUIDE,CARD	SCANBE	R-308-21-M-L
3	10	401-98-00007		GUIDE,CARD	SCANBE	R-308-21-M-R
4	A/R	229-98-00070		SCREW,4-40X5/16,PAN HD	QVL	BY DESCRIPTION
5	A/R	060-11-00001		COMP, LOCTITE,GRADE A	AMER SEALANT	BY DESCRIPTION
6	A/R	273-98-00015		WASHER,#4,FLAT,NYLON	H H SMITH	2514
7	14	239-98-00072		SPACER	SCANBE	R-102-288
8	1	223-98-00001		ROD	SCANBE	R-901-16.000
9	1	223-98-00002		ROD	SCANBE	R-901-9.375
10	3	239-98-00071		SPACER	SCANBE	R-102-093
11	3	281-98-00002		STOP	SCANBE	R-902
12	1	412-98-00002		IDENT. RET	SCANBE	S-904-5.750
13	1	246-99-00029	19404	STRIP, IDENT.	EMR	246-99-00029
14	A/R	070-98-00004		CORD,NYLON LACE,B FINISH	QVL/GUDEBROD	MIL-T-43435 / #20
15	4	239-98-00073		SPACER	SCANBE	R-111-288
C 1	1	354-70-40006		CAP., 4000MF -10&75% 25V	SPRAGUE	39D408G025JS4
C 2	1	354-64-23006		CAP.,2300 MF -10,&70%,50V	SPRAGUE	39D-238-G-050-JT-4
C 3	1	354-65-11006		CAP.,1100 MF -10,&70%,50V	SPRAGUE	39D-118-G-050-HP-4
CR 1 THRU CR 3	3	214-98-00017		RECT	MOT	MDA970-2
REF 1	1	905-13-00128	19387	WIRING DIAGRAM	EMR	905-13-00128
REF 2	1	905-04-00001	9500	SPEC,COMPONENT SPACING	EMR	905-04-00001

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ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R3	1	608-09-19600	624	RES, 1.96K 1% 1/10W	SPEC	624
R4	1	608-09-68100	624	RES. 6.81K 1% 1/10W	SPEC	624
R5	1	601-86-00059		RES.,.5 OHM 3% 10W 100PPM	DALE	RS10
R6	1	616-02-03909		RES,39 OHM 5% 1/4W	ALLEN BRAD	RC07GF390J
R7	1	608-09-11300	624	RES, 1.13K 1% 1/10W	SPEC	624
R8	1	608-09-51100	624	RES, 5.11K 1% 1/10W	SPEC	624
R9	1	616-02-00479		RES. 4.7 OHM 5% 1/4W	ALLEN BRAD	RC07GF4R7J
R10	1	616-02-00479		RES. 4.7 OHM 5% 1/4W	ALLEN BRAD	RC07GF4R7J
R11	1	616-02-00479		RES. 4.7 OHM 5% 1/4W	ALLEN BRAD	RC07GF4R7J
R12	1	616-02-00479		RES. 4.7 OHM 5% 1/4W	ALLEN BRAD	RC07GF4R7J
R13	1	616-02-00479		RES. 4.7 OHM 5% 1/4W	ALLEN BRAD	RC07GF4R7J
R14	1	616-02-00479		RES. 4.7 OHM 5% 1/4W	ALLEN BRAD	RC07GF4R7J
R15	1	616-02-00479		RES. 4.7 OHM 5% 1/4W	ALLEN BRAD	RC07GF4R7J
R16	1	616-02-00479		RES. 4.7 OHM 5% 1/4W	ALLEN BRAD	RC07GF4R7J
TP1	1	143-98-00037		JACK,TEST BLACK .46X.23	AMP	3-582118-0
TP2	1	143-98-00037		JACK,TEST BLACK .46X.23	AMP	3-582118-0
U1	1	046-14-00006		INTCKT,WHEN STK DEPLETED	SYL	SG-142-03
U2	1	046-14-00006		INTCKT,WHEN STK DEPLETED	SYL	SG-142-03
U3	1	046-14-00006		INTCKT,WHEN STK DEPLETED	SYL	SG-142-03
U4	1	046-14-00006		INTCKT,WHEN STK DEPLETED	SYL	SG-142-03
U5	1	046-14-00006		INTCKT,WHEN STK DEPLETED	SYL	SG-142-03
U6	1	046-14-00006		INTCKT,WHEN STK DEPLETED	SYL	SG-142-03
U7	1	046-14-00006		INTCKT,WHEN STK DEPLETED	SYL	SG-142-03
U8	1	046-14-00006		INTCKT,WHEN STK DEPLETED	SYL	SG-142-03

Table 6-4 (Cont'd.) 205-89-00930 19380 SHT 3

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
U9	1	046-14-00007		INTCKT,WHEN STK DEPLETED	SYL	SG-143-03
U10	1	046-14-00007		INTCKT,WHEN STK DEPLETED	SYL	SG-143-03
U11	1	046-14-00007		INTCKT,WHEN STK DEPLETED	SYL	SG-143-03
U12	1	046-14-00007		INTCKT,WHEN STK DEPLETED	SYL	SG-143-03
U13	1	046-14-00007		INTCKT,WHEN STK DEPLETED	SYL	SG-143-03
U14	1	046-14-00007		INTCKT,WHEN STK DEPLETED	SYL	SG-143-03
U15	1	046-16-00019		INTCKT,POS VOLT REGULATOR	MOT	MC1461R
REF1	1	905-01-00671	19378	SCHEMATIC,PWA		
REF2	1	905-04-00001	9500	SPEC,COMPONENT SPACING		

FIRST USAGE MODEL 516

Table 6-5

PARTS LIST 19377 REV DATE 04/08/70 REV LTR A

LIST TITLE PWA,DIGITAL ANALOG CHGE CONT NO. CODE IDENT SHT 1 OF 6
PART NO. 205-89-00928 ECO 39922 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-89-00342	19376	PWB,DAC SELECTOR	EMR	204-89-00342
2	4	189-98-00011		PAD,XSTR TO-5 8 PIN .075	MILTON ROSS	10193-DAP
3	A/R	276-99-00007	619-20	WIRE,#20,BUSS,SOLID	EMR	276-99-00007
4	A/R	268-02-00038		TUBING,#20,EXTR TEF,WHT	QVL	MIL-I-22129
5	A/R	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	EMR	276-99-00008
C 1	1	304-41-68009	600	CAP. 680PF 1% 300V	EMR	304-41-68009
C 3	1	304-08-03009	600	CAP. 30PF .5PF 500V	EMR	304-08-03009
C 5	1	337-23-68003	601	CAP., 6.8MF 20% 35V	EMR	337-23-68003
C 6	1	337-23-68003	601	CAP., 6.8MF 20% 35V	EMR	337-23-68003
C 8	1	337-23-33003	601	CAP., 3.3MF 20% 35V	EMR	337-23-33003
C 10	1	336-23-10003	601	CAP., 1.0MF 20% 35V	EMR	336-23-10003
C 11	1	337-21-10004	601	CAP., 10MF 20% 15V	EMR	337-21-10004
C 12	1	304-41-68009	600	CAP. 680PF 1% 300V	EMR	304-41-68009
C 14	1	304-08-03009	600	CAP. 30PF .5PF 500V	EMR	304-08-03009
C 16	1	304-41-68009	600	CAP. 680PF 1% 300V	EMR	304-41-68009
C 18	1	304-08-03009	600	CAP. 30PF .5PF 500V	EMR	304-08-03009
C 20	1	304-41-68009	600	CAP. 680PF 1% 300V	EMR	304-41-68009
C 22	1	304-08-03009	600	CAP. 30PF .5PF 500V	EMR	304-08-03009
P 1	1	063-98-00162		CONN,RECP,52 POSN .150 SP	AMP	1-85927-8
R 1 THRU R 8	8	620-02-10001		RES, 10K 5% 1/8W	ALLEN BRAD	RC05GF103J
R 9	1	656-05-19751		RES, 19.75K .1% .08W	RIEDON	SM-3

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ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R 10	1	616-02-39001		RES,39K 5% 1/4W	ALLEN BRAD	RC07GF393J
R 11	1	656-05-39501		RES, 39.5 K .1% .08W	RIEDON	SM-3
R 12	1	616-02-27001		RES,27K 5% 1/4W	ALLEN BRAD	RC07GF273J
R 13	1	656-06-79001		RES, 79.0 K .25% .08W	RIEDON	SM-3
R 14	1	616-02-22001		RES,22K 5% 1/4W	ALLEN BRAD	RC07GF223J
R 15	1	656-07-15802		RES, 158.0K .5% .08W	RIEDON	SM-3
R 16	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 17	1	608-09-31602	624	RES, 316.0K 1% 1/10W	EMR	608-09-31602
R 18	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 19	1	608-01-63402	624	RES, 634K 1% 1/10W 100 PP	EMR	608-01-63402
R 20	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 21	1	608-01-12703	624	RES, 1.27M 1% 1/10W 100PP	EMR	608-01-12703
R 22	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 23	1	616-02-51003		RES,5.1 MEG 5% 1/4W	ALLEN BRAD	RC07GF515J
R 24	1	616-02-47003		RES,4.7 MEG 5% 1/4W	ALLEN BRAD	RC07GF475J
R 25	1	608-09-26700	624	RES, 2.67K 1% 1/10W	EMR	608-09-26700
R 27	1	656-04-99000		RES, 9.90 K .05% .08W	RIEDON	SM-3
R 28	1	656-04-42000		RES, 4.20 K .05% .08W	RIEDON	SM-3
R 29	1	608-09-04999	624	RES, 49.9 OHM 1% 1/10W	EMR	608-09-04999
R 30	1	608-09-11009	624	RES, 110.0 OHM 1% 1/10W	EMR	608-09-11009
R 32 THRU R 39	8	620-02-10001		RES, 10K 5% 1/8W	ALLEN BRAD	RC05GF103J
R 40	1	656-05-19751		RES, 19.75K .1% .08W	RIEDON	SM-3
R 41	1	616-02-39001		RES,39K 5% 1/4W	ALLEN BRAD	RC07GF393J

FIRST USAGE MODEL 516

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R 42	1	656-05-39501		RES, 39.5 K .1% .08W	RIEDON	SM-3
R 43	1	616-02-27001		RES,27K 5% 1/4W	ALLEN BRAD	RC07GF273J
R 44	1	656-06-79001		RES, 79.0 K .25% .08W	RIEDON	SM-3
R 45	1	616-02-22001		RES,22K 5% 1/4W	ALLEN BRAD	RC07GF223J
R 46	1	656-07-15802		RES, 158.0K .5% .08W	RIEDON	SM-3
R 47	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 48	1	608-09-31602	624	RES, 316.0K 1% 1/10W	EMR	608-09-31602
R 49	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 50	1	608-01-63402	624	RES, 634K 1% 1/10W 100 PP	EMR	608-01-63402
R 51	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 52	1	608-01-12703	624	RES, 1.27M 1% 1/10W 100PP	EMR	608-01-12703
R 53	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 54	1	616-02-51003		RES,5.1 MEG 5% 1/4W	ALLEN BRAD	RC07GF515J
R 55	1	616-02-47003		RES,4.7 MEG 5% 1/4W	ALLEN BRAD	RC07GF475J
R 56	1	608-09-26700	624	RES, 2.67K 1% 1/10W	EMR	608-09-26700
R 58	1	656-04-99000		RES, 9.90 K .05% .08W	RIEDON	SM-3
R 59	1	656-04-42000		RES, 4.20 K .05% .08W	RIEDON	SM-3
R 60	1	608-09-04999	624	RES, 49.9 OHM 1% 1/10W	EMR	608-09-04999
R 61	1	608-09-11009	624	RES, 110.0 OHM 1% 1/10W	EMR	608-09-11009
R 62 THRU R 69	8	620-02-10001		RES, 10K 5% 1/8W	ALLEN BRAD	RC05GF103J
R 70	1	656-05-19751		RES, 19.75K .1% .08W	RIEDON	SM-3
R 71	1	616-02-39001		RES,39K 5% 1/4W	ALLEN BRAD	RC07GF393J
R 72	1	656-05-39501		RES, 39.5 K .1% .08W	RIEDON	SM-3

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ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R 73	1	616-02-27001		RES,27K 5% 1/4W	ALLEN BRAD	RC07GF273J
R 74	1	656-06-79001		RES, 79.0 K .25% .08W	RIEDON	SM-3
R 75	1	616-02-22001		RES,22K 5% 1/4W	ALLEN BRAD	RC07GF223J
R 76	1	656-07-15802		RES, 158.0K .5% .08W	RIEDON	SM-3
R 77	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 78	1	608-09-31602	624	RES, 316.0K 1% 1/10W	EMR	608-09-31602
R 79	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 80	1	608-01-63402	624	RES, 634K 1% 1/10W 100 PP	EMR	608-01-63402
R 81	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 82	1	608-01-12703	624	RES, 1.27M 1% 1/10W 100PP	EMR	608-01-12703
R 83	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 84	1	616-02-47003		RES,4.7 MEG 5% 1/4W	ALLEN BRAD	RC07GF475J
R 85	1	616-02-51003		RES,5.1 MEG 5% 1/4W	ALLEN BRAD	RC07GF515J
R 86	1	608-09-26700	624	RES, 2.67K 1% 1/10W	EMR	608-09-26700
R 88	1	656-04-99000		RES, 9.90 K .05% .08W	RIEDON	SM-3
R 89	1	656-04-42000		RES, 4.20 K .05% .08W	RIEDON	SM-3
R 90	1	608-09-04999	624	RES, 49.9 OHM 1% 1/10W	EMR	608-09-04999
R 91	1	608-09-11009	624	RES, 110.0 OHM 1% 1/10W	EMR	608-09-11009
R 92 THRU R 99	8	620-02-10001		RES, 10K 5% 1/8W	ALLEN BRAD	RC05GF103J
R 100	1	656-05-19751		RES, 19.75K .1% .08W	RIEDON	SM-3
R 101	1	616-02-39001		RES,39K 5% 1/4W	ALLEN BRAD	RC07GF393J
R 102	1	656-05-39501		RES, 39.5 K .1% .08W	RIEDON	SM-3
R 103	1	616-02-27001		RES,27K 5% 1/4W	ALLEN BRAD	RC07GF273J

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ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R 104	1	656-06-79001		RES, 79.0 K .25% .08W	RIEDON	SM-3
R 105	1	616-02-22001		RES,22K 5% 1/4W	ALLEN BRAD	RC07GF223J
R 106	1	656-07-15802		RES, 158.0K .5% .08W	RIEDON	SM-3
R 107	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 108	1	608-09-31602	624	RES, 316.0K 1% 1/10W	EMR	608-09-31602
R 109	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 110	1	608-01-63402	624	RES, 634K 1% 1/10W 100 PP	EMR	608-01-634C2
R 111	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 112	1	608-01-12703	624	RES, 1.27M 1% 1/10W 100PP	EMR	608-01-12703
R 113	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 114	1	616-02-51003		RES,5.1 MEG 5% 1/4W	ALLEN BRAD	RC07GF515J
R 115	1	616-02-47003		RES,4.7 MEG 5% 1/4W	ALLEN BRAD	RC07GF475J
R 116	1	608-09-26700	624	RES, 2.67K 1% 1/10W	EMR	608-09-26700
R 118	1	656-04-99000		RES, 9.90 K .05% .08W	RIEDON	SM-3
R 119	1	656-04-42000		RES, 4.20 K .05% .08W	RIEDON	SM-3
R 120	1	608-09-04999	624	RES, 49.9 OHM 1% 1/10W	EMR	608-09-04999
R 121	1	608-09-11009	624	RES, 110.0 OHM 1% 1/10W	EMR	608-09-11009
U 1	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 2	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 3	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 4	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 5	1	046-34-00004		INTCKT,OPNL AMPL 18V	NAT SEMI	LM301AH
U 6	1	046-14-00007		INTCKT	SYL	SG-143-03
U 7	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03

FIRST USAGE MODEL 516

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
U 8	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 9	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 10	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 11	1	046-34-00004		INTCKT,OPNL AMPL 18V	NAT SEMI	LM301AH
U 12	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 13	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 14	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 15	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 16	1	046-34-00004		INTCKT,OPNL AMPL 18V	NAT SEMI	LM301AH
U 17	1	046-14-00007		INTCKT	SYL	SG-143-03
U 18	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 19	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 20	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 21	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 22	1	046-34-00004		INTCKT,OPNL AMPL 18V	NAT SEMI	LM301AH
REF 1	1	905-01-00669	19375	SCHEMATIC,PWA	EMR	905-01-00669
REF 2	1	905-04-00001	9500	SPEC,COMPONENT SPACING	EMR	905-04-00001

FIRST USAGE MODEL 516

Table 6-5A

PARTS LIST 19377-1 REV DATE 01/18/71 REV LTR

LIST TITLE PWA, DIGITAL ANALOG CHGE CONT NO. CODE IDENT SHT 1 OF 6
PART NO. 205-89-01030 ECO C6141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-89-00342	19376	PWB,DAC SELECTOR	EMR	204-89-00342
2	4	189-98-00011		PAD,XSTR TO-5 8 PIN .075	MILTON ROSS	10193-DAP
3	A/R	276-99-00007	619-20	WIRE,#20,BUSS,SOLID	EMR	276-99-00007
4	A/R	268-02-00038		TUBING,#20,EXTR TEF,WHT	QVL	MIL-I-22129
5	A/R	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	EMR	276-99-00008
C 1	1	304-41-68009	600	CAP. 680PF 1% 300V	EMR	304-41-68009
C 3	1	304-08-03009	600	CAP. 30PF .5PF 500V	EMR	304-08-03009
C 5	1	337-23-68003	601	CAP., 6.8MF 20% 35V	EMR	337-23-68003
C 6	1	337-23-68003	601	CAP., 6.8MF 20% 35V	EMR	337-23-68003
C 8	1	337-23-33003	601	CAP., 3.3MF 20% 35V	EMR	337-23-33003
C 10	1	336-23-10003	601	CAP., 1.0MF 20% 35V	EMR	336-23-10003
C 11	1	337-21-10004	601	CAP., 10MF 20% 15V	EMR	337-21-10004
C 12	1	304-41-68009	600	CAP. 680PF 1% 300V	EMR	304-41-68009
C 14	1	304-08-03009	600	CAP. 30PF .5PF 500V	EMR	304-08-03009
C 16	1	304-41-68009	600	CAP. 680PF 1% 300V	EMR	304-41-68009
C 18	1	304-08-03009	600	CAP. 30PF .5PF 500V	EMR	304-08-03009
C 20	1	304-41-68009	600	CAP. 680PF 1% 300V	EMR	304-41-68009
C 22	1	304-08-03009	600	CAP. 30PF .5PF 500V	EMR	304-08-03009
P 1	1	063-98-00162		CONN,RECP,52 POSN .150 SP	AMP	1-85927-8
R 1 THRU R 8	8	620-02-10001		RES, 10K 5% 1/8W	ALLEN BRAD	RC05GF103J
R 9	1	656-05-19751		RES, 19.75K .1% .08W	RIEDON	SM-3

FIRST USAGE MODEL 516

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R 10	1	616-02-39001		RES,39K 5% 1/4W	ALLEN BRAD	RC07GF393J
R 11	1	656-05-39501		RES, 39.5 K .1% .08W	RIEDON	SM-3
R 12	1	616-02-27001		RES,27K 5% 1/4W	ALLEN BRAD	RC07GF273J
R 13	1	656-06-79001		RES, 79.0 K .25% .08W	RIEDON	SM-3
R 14	1	616-02-22001		RES,22K 5% 1/4W	ALLEN BRAD	RC07GF223J
R 15	1	656-07-15802		RES, 158.0K .5% .08W	RIEDON	SM-3
R 16	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 17	1	608-09-31602	624	RES, 316.0K 1% 1/10W	EMR	608-09-31602
R 18	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 19	1	608-01-63402	624	RES, 634K 1% 1/10W 100 PP	EMR	608-01-63402
R 20	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 21	1	608-01-12703	624	RES, 1.27M 1% 1/10W 100PP	EMR	608-01-12703
R 22	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 23	1	616-02-51003		RES,5.1 MEG 5% 1/4W	ALLEN BRAD	RC07GF515J
R 24	1	616-02-47003		RES,4.7 MEG 5% 1/4W	ALLEN BRAD	RC07GF475J
R 25	1	608-09-26700	624	RES, 2.67K 1% 1/10W	EMR	608-09-26700
R 27	1	656-04-99000		RES, 9.90 K .05% .08W	RIEDON	SM-3
R 28	1	656-04-63580		RES, 6.358K .05% .08W	RIEDON	SM-3
R 29	1	608-09-04999	624	RES, 49.9 OHM 1% 1/10W	EMR	608-09-04999
R 30	1	608-09-11009	624	RES, 110.0 OHM 1% 1/10W	EMR	608-09-11009
R 32 THRU R 39	8	620-02-10001		RES, 10K 5% 1/8W	ALLEN BRAD	RC05GF103J
R 40	1	656-05-19751		RES, 19.75K .1% .08W	RIEDON	SM-3
R 41	1	616-02-39001		RES,39K 5% 1/4W	ALLEN BRAD	RC07GF393J

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ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R 42	1	656-05-39501		RES, 39.5 K .1% .08W	RIEDON	SM-3
R 43	1	616-02-27001		RES,27K 5% 1/4W	ALLEN BRAD	RC07GF273J
R 44	1	656-06-79001		RES, 79.0 K .25% .08W	RIEDON	SM-3
R 45	1	616-02-22001		RES,22K 5% 1/4W	ALLEN BRAD	RC07GF223J
R 46	1	656-07-15802		RES, 158.0K .5% .08W	RIEDON	SM-3
R 47	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 48	1	608-09-31602	624	RES, 316.0K 1% 1/10W	EMR	608-09-31602
R 49	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 50	1	608-01-63402	624	RES, 634K 1% 1/10W 100 PP	EMR	608-01-63402
R 51	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 52	1	608-01-12703	624	RES, 1.27M 1% 1/10W 100PP	EMR	608-01-12703
R 53	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 54	1	616-02-51003		RES,5.1 MEG 5% 1/4W	ALLEN BRAD	RC07GF515J
R 55	1	616-02-47003		RES,4.7 MEG 5% 1/4W	ALLEN BRAD	RC07GF475J
R 56	1	608-09-26700	624	RES, 2.67K 1% 1/10W	EMR	608-09-26700
R 58	1	656-04-99000		RES, 9.90 K .05% .08W	RIEDON	SM-3
R 59	1	656-04-63580		RES, 6.358K .05% .08W	RIEDON	SM-3
R 60	1	608-09-04999	624	RES, 49.9 OHM 1% 1/10W	EMR	608-09-04999
R 61	1	608-09-11009	624	RES, 110.0 OHM 1% 1/10W	EMR	608-09-11009
R 62 THRU R 69	8	620-02-10001		RES, 10K 5% 1/8W	ALLEN BRAD	RC05GF103J
R 70	1	656-05-19751		RES, 19.75K .1% .08W	RIEDON	SM-3
R 71	1	616-02-39001		RES,39K 5% 1/4W	ALLEN BRAD	RC07GF393J
R 72	1	656-05-39501		RES, 39.5 K .1% .08W	RIEDON	SM-3

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ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R 73	1	616-02-27001		RES,27K 5% 1/4W	ALLEN BRAD	RC07GF273J
R 74	1	656-06-79001		RES, 79.0 K .25% .08W	RIEDON	SM-3
R 75	1	616-02-22001		RES,22K 5% 1/4W	ALLEN BRAD	RC07GF223J
R 76	1	656-07-15802		RES, 158.0K .5% .08W	RIEDON	SM-3
R 77	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 78	1	608-09-31602	624	RES, 316.0K 1% 1/10W	EMR	608-09-31602
R 79	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 80	1	608-01-63402	624	RES, 634K 1% 1/10W 100 PP	EMR	608-01-63402
R 81	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 82	1	608-01-12703	624	RES, 1.27M 1% 1/10W 100PP	EMR	608-01-12703
R 83	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 84	1	616-02-47003		RES,4.7 MEG 5% 1/4W	ALLEN BRAD	RC07GF475J
R 85	1	616-02-51003		RES,5.1 MEG 5% 1/4W	ALLEN BRAD	RC07GF515J
R 86	1	608-09-26700	624	RES, 2.67K 1% 1/10W	EMR	608-09-26700
R 88	1	656-04-99000		RES, 9.90 K .05% .08W	RIEDON	SM-3
R 89	1	656-04-63580		RES, 6.358K .05% .08W	RIEDON	SM-3
R 90	1	608-09-04999	624	RES, 49.9 OHM 1% 1/10W	EMR	608-09-04999
R 91	1	608-09-11009	624	RES, 110.0 OHM 1% 1/10W	EMR	608-09-11009
R 92 THRU R 99	8	620-02-10001		RES, 10K 5% 1/8W	ALLEN BRAD	RC05GF103J
R 100	1	656-05-19751		RES, 19.75K .1% .08W	RIEDON	SM-3
R 101	1	616-02-39001		RES,39K 5% 1/4W	ALLEN BRAD	RC07GF393J
R 102	1	656-05-39501		RES, 39.5 K .1% .08W	RIEDON	SM-3
R 103	1	616-02-27001		RES,27K 5% 1/4W	ALLEN BRAD	RC07GF273J

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ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R 104	1	656-06-79001		RES, 79.0 K .25% .08W	RIEDON	SM-3
R 105	1	616-02-22001		RES,22K 5% 1/4W	ALLEN BRAD	RC07GF223J
R 106	1	656-07-15802		RES, 158.0K .5% .08W	RIEDON	SM-3
R 107	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 108	1	608-09-31602	624	RES, 316.0K 1% 1/10W	EMR	608-09-31602
R 109	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 110	1	608-01-63402	624	RES, 634K 1% 1/10W 100 PP	EMR	608-01-63402
R 111	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 112	1	608-01-12703	624	RES, 1.27M 1% 1/10W 100PP	EMR	608-01-12703
R 113	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R 114	1	616-02-51003		RES,5.1 MEG 5% 1/4W	ALLEN BRAD	RC07GF515J
R 115	1	616-02-47003		RES,4.7 MEG 5% 1/4W	ALLEN BRAD	RC07GF475J
R 116	1	608-09-26700	624	RES, 2.67K 1% 1/10W	EMR	608-09-26700
R 118	1	656-04-99000		RES, 9.90 K .05% .08W	RIEDON	SM-3
R 119	1	656-04-63580		RES, 6.358K .05% .08W	RIEDON	SM-3
R 120	1	608-09-04999	624	RES, 49.9 OHM 1% 1/10W	EMR	608-09-04999
R 121	1	608-09-11009	624	RES, 11C.0 OHM 1% 1/10W	EMR	608-09-11009
U 1	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 2	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 3	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 4	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 5	1	046-34-00004		INTCKT,CPNL AMPL 18V	NAT SEMI	LM301AH
U 6	1	046-14-00007		INTCKT	SYL	SG-143-03
U 7	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03

FIRST USAGE MODEL 516

Table 6-5A (Cont'd.) 205-89-01030 19377-1 SHT 6 OF 6

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
U 8	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 9	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 10	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 11	1	046-34-00004		INTCKT,OPNL AMPL 18V	NAT SEMI	LM301AH
U 12	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 13	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 14	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 15	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 16	1	046-34-00004		INTCKT,OPNL AMPL 18V	NAT SEMI	LM301AH
U 17	1	046-14-00007		INTCKT	SYL	SG-143-03
U 18	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 19	1	046-14-00016		INTCKT,4 BIT STORAGE	SYL	SM73-03
U 20	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 21	1	046-15-00003		INTCKT,3 XSTR AND 1 DIFF	RCA	CA3045 OR CA3046
U 22	1	046-34-00004		INTCKT,OPNL AMPL 18V	NAT SEMI	LM301AH
REF 1	1	905-01-00669	19375	SCHEMATIC,PWA	EMR	905-01-00669
REF 2	1	905-04-00001	9500	SPEC,COMPONENT SPACING	EMR	905-04-00001

FIRST USAGE MODEL 516

Table 6-6

PARTS LIST 19383 REV DATE REV LTR

LIST TITLE PWA,REGULATOR CHGE CONT NO. CODE IDENT SHT 1 OF 4
PART NO. 205-89-00929 ECO 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-99-00619	19382	PWB,REGULATOR	SPEC	19382
2	1	298-99-00027	18897-1	HTSK 5 TPYE TO-66	SPEC	18897-1
4	8	273-02-00036		WASHER,#4,SPLIT LOCK	QVL	MS35338-135
5	8	287-02-00002		NUT,HEX, 4-40	QVL	MS35649-244
6	8	229-02-00076		SCREW,4-40X7/16 PAN HD	QVL	MS51957-16
7	4	140-98-00007		INS,MICA TO-66 TRANSISTOR	SPR PIN MICA	136
8	A/R	060-21-00002		COMP,HEAT SINK	DOW CORNING	#340
9	2	189-98-00016		PAD,XSTR TO-5 8 PIN,.075	MILTON ROSS	10249-N
10	2	189-98-00010		PAD,XSTR TO-5 10 PIN .075	MILTON ROSS	10247-N
11	5	189-98-00004		PAD,XSTR TO-18 4 PIN,.15	DEL BLINN	TP-100
C1	1	304-62-10000	600	CAP. 1000PF 1% 100V	SPEC	600
C2	1	336-23-22002	601	CAP., .22MF 20% 35V	SPEC	601
C3	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601
C4	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601
C5	1	301-13-10002		CAP., .1MF 20% 50V LS.200	ERIE	8131-050-651-104M
C6	1	301-13-10002		CAP., .1MF 20% 50V LS.200	ERIE	8131-050-651-104M
C7	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601
C8	1	337-23-68003	601	CAP. 6.8MF 20% 35V	SPEC	601
C9	1	336-23-47002	601	CAP., .47MF 20% 35V	SPEC	601
C10	1	304-08-03009	600	CAP. 30PF .5PF 500V	SPEC	600
C11	1	304-08-03009	600	CAP. 30PF .5PF 500V	SPEC	600
CR1	1	088-10-41480		DIODE	JEDEC	1N4148

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Table 6-6 (Cont'd.) 205-89-00929 19383 SHT 2

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
CR2	1	088-10-41480		DIODE	JEDEC	1N4148
CR3	1	088-10-41480		DIODE	JEDEC	1N4148
CR4	1	088-10-41480		DIODE	JEDEC	1N4148
CR5	1	088-10-09390		DIODE,ZENER 9V 5% @ 7.5MA	JEDEC	1N939
CR6	1	088-10-09642		DIODE,VOLTAGE REG.13V 5%	JEDEC	1N9648
CR7	1	088-99-00099	642-00	DIODE,1N746A ZENER 3.3V	SPEC	642-00
P1	1	063-98-00162		CONN,RECP,52 POSN .150 SP	AMP	1-85927-8
Q1	1	263-10-37400		XSTR	JEDEC	2N3740
Q2	1	263-10-39470		XSTR	JEDEC	2N3947
Q3	1	263-10-32510		XSTR,PNP,SWITCH/AMP 50V	MML 15	2N3251
Q4	1	263-10-32510		XSTR,PNP,SWITCH/AMP 50V	MML 15	2N3251
Q5	1	263-10-37400		XSTR	JEDEC	2N3740
Q6	1	263-10-32510		XSTR,PNP,SWITCH/AMP 50V	MML 15	2N3251
Q7	1	263-10-37660		XSTR	JEDEC	2N3766
Q8	1	263-10-32510		XSTR,PNP,SWITCH/AMP 50V	MML 15	2N3251
Q9	1	263-10-37660		XSTR	JEDEC	2N3766
R1	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R2	1	608-09-80609	624	RES, 806.0 OHM 1% 1/10W	SPEC	624
R3	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J
R4	1	616-02-43002		RES,430K 5% 1/4W	ALLEN BRAD	RC07GF434J
R5	1	616-02-13001		RES,13K 5% 1/4W	ALLEN BRAD	RC07GF133J
R6	1	602-10-00049		RES, 0.4 OHM 1% .15W	DALE	WWA-22
R7	1	608-09-20000	624	RES. 2.0K 1% 1/10W	SPEC	624
R8	1	201-98-00189		POT., 500 OHM PCB .29 RES	BOURNS	3290P-1-501

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Table 6-6 (Cont'd.) 205-89-00929 19383 SHT 3

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R9	1	608-09-10000	624	RES. 1K 1% 1/10W	SPEC	624
R10	1	616-02-01009		RES,10 OHM 5% 1/4W	ALLEN BRAD	RC07GF100J
R11	1	608-09-20000	624	RES. 2.0K 1% 1/10W	SPEC	624
R12	1	608-09-23700	624	RES., 2.37K 1% 1/10W	SPEC	624
R13	1	201-98-00189		POT., 500 OHM PCB .29 RES	BOURNS	3290P-1-501
R14	1	608-09-57600	624	RES. 5.76K 1% 1/10W	SPEC	624
R15	1	616-02-03309		RES,33 OHM 5% 1/4W	ALLEN BRAD	RC07GF330J
R16	1	608-09-11801	624	RES, 11.8K 1% 1/10W	SPEC	624
R17	1	608-09-13700	624	RES. 1.37K OHM 1% 1/10W	SPEC	624
R18	1	601-13-00309		RES, 3.0 OHM 1% .5W	DALE	RS1/2
R19	1	608-09-15800	624	RES. 1.58K 1% 1/10W	SPEC	624
R20	1	608-09-23209	624	RES, 232.0 OHM 1% 1/10W	SPEC	624
R21	1	616-02-47000		RES,4.7K 5% 1/4W	ALLEN BRAD	RC07GF472J
R23	1	201-98-00197		POT., 500 OHM 5% .75W	CLAROSTAT	76JA-3
R24	1	656-07-28300		RES, 2.830 K .5% .08W	RIEDON	SM-3
R25	1	601-05-00159		RES, 1.5 OHM 1% .25W	DALE	RS1/4
R26	1	623-03-01009		RES, 10 OHM 10% 1W	ALLEN BRAD	RC32GF100K
R27	1	608-09-11300	624	RES, 1.13K 1% 1/10W	SPEC	624
R28	1	601-05-00409		RES, 4.0 OHM 1% .25W	DALE	RS1/4
R29	1	622-03-01009		RES., 10 OHM 10% 1/2W	ALLEN BRAD	RC20GF100K
R30	1	656-99-00001	19405	RES,1.82K & 2.83K .5%	SPEC	19405
R31	1	201-98-00198		POT., 100 OHM 5% .75W	CLAROSTAT	76JA-3
R33	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J
R34	1	616-02-20001		RES,20K 5% 1/4W	ALLEN BRAD	RC07GF203J

FIRST USAGE MODEL 516

Table 6-6 (Cont'd.) 205-89-00929 19383 SHT 4

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
TP1	1	143-98-00037		JACK,TEST BLACK .46X.23	AMP	3-582118-0
TP2	1	143-98-00037		JACK,TEST BLACK .46X.23	AMP	3-582118-0
TP3	1	143-98-00017		JACK TEST POINT, RED	AMP INC.	3-582340-2
TP4	1	143-98-00017		JACK TEST POINT, RED	AMP INC.	3-582340-2
TP5	1	143-98-00017		JACK TEST POINT, RED	AMP INC.	3-582340-2
U1	1	046-18-00020		INTCKT,VOLTAGE REGULATOR	FCH	U5R7723393
U2	1	046-34-00008		INTCKT,NEG VOLT REGULATOR	NSC	LM304H
U3	1	046-34-00004		INTCKT,OPNL AMPL 18V	NAT SEMI	LM301AH
U4	1	046-34-00004		INTCKT,OPNL AMPL 18V	NAT SEMI	LM301AH
REF1	1	905-01-00670	19381	SCHEMATIC,PWA		
REF2	1	905-04-00001	9500	SPEC,COMPONENT SPACING		

FIRST USAGE MODEL 516

Table 6-7

PARTS LIST 20161 REV DATE REV LTR

LIST TITLE PRCGMR,ASSY,DAC CHGE CONT NO. CODE IDENT SHT 1 OF 2
PART NO. 420-89-00008 ECO 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	042-89-00156	20185	CHAS,ASSY,WELDMENT	SPEC	20185
2	1	191-99-00350	19708-1	PANEL,FRONT	SPEC	19708-1
3	1	191-99-00351	20188	PANEL,REAR,PLUG-IN	SPEC	20188
4	1	205-89-00948	19411	PWA,DAC PROGRAMMER	SPEC	19411
5	1	111-98-00016		FASTENER,PAWL RH	SOUTHCO	27-10-301-20
6	1	128-98-00007		HANDLE,ALUM BLACK ANODIZE	CAMBION	415-1290-03-14
8	A/R	229-02-00102		SCREW,8-32X1/2 PAN HD	QVL	MS51957-45
9	A/R	273-02-00039		WASHER,#8,SPLIT LOCK	QVL	MS35338-137
10	A/R	273-02-00009		WASHER,#8, FLT ST STL	QVL	NAS620C8
11	A/R	229-02-00187		SCREW,4-40X3/8,FLT HD	QVL	MS51959-15
12	A/R	229-02-00074		SCREW,4-40X5/16 PAN HD	QVL	MS51957-14
14	A/R	273-02-00036		WASHER,#4,SPLIT LOCK	QVL	MS35338-135
15	A/R	273-02-00005		WASHER,#4, FLT ST STL	QVL	MS15795-804
16	A/R	287-02-00002		NUT,HEX, 4-40	QVL	MS35649-244
17	A/R	060-11-00002		COMP, LOCTITE, TYPE H	AMER SEALANT	BY DESCRIPTION
18	A/R	999-02-00002	10674	PLUG,DIODE,POA VAR		
19	A/R	276-98-00102		WIRE,#24,STRD,WHT,600V	QVL	NAS-703-24-U-C-9
20	A/R	999-03-00003	10674	PLUG,DIODE,THRD,PCA VAR		
21	A/R	999-03-00001	10674	BCARD,PRE-PROGM,L,PCA VAR		
22	A/R	999-03-00002	10674	BCARD,PRE-PROGM,L,PCA VAR		
P1	1	063-98-00041		CONN,RECP,24PIN,R&P	AMPHENOL	26-19C-24
REF1	1	905-14-0021C	20153	WIRE LIST		

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Table 6-7 (Cont'd.) .420-89-00006 20161 SHT 2

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
REF2	1	905-05-00263	10674	VARIABLE CHART MODEL 516		

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Table 6-8

PARTS LIST 19411 REV DATE REV LTR

LIST TITLE PWA DAC PROGRAMMER CHGE CONT NO. CODE IDENT SHT 1 OF 3
PART NO. 205-89-00948 ECO 06141 CKD BY

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-89-00357	19410	PWB,DAC PROGRAMMER	SPEC	19410
2	1	015-98-00009		BOARD, MATRIX PROGRAM	INTERSWITCH	673.11.214
3	8	236-98-00040		SOCKET,24PIN DUAL IN LINE	MML 21	703-3790-01-04-16
4	10	236-98-00026		SOCKET,14PIN,IN LINE,INTC	AUGAT	314-AG5D-R
C1	1	337-21-10004	601	CAP. 10MF 20% 15V	SPEC	601
C2	1	337-21-10004	601	CAP. 10MF 20% 15V	SPEC	601
CR1	1	088-10-41480		DIODE	JEDEC	1N4148
CR2	1	088-10-41480		DIODE	JEDEC	1N4148
CR3	1	088-10-41480		DIODE	JEDEC	1N4148
CR4	1	088-10-41480		DIODE	JEDEC	1N4148
CR5	1	088-10-41480		DIODE	JEDEC	1N4148
CR6	1	088-10-41480		DIODE	JEDEC	1N4148
CR7	1	088-10-41480		DIODE	JEDEC	1N4148
CR8	1	088-10-41480		DIODE	JEDEC	1N4148
CR9	1	088-10-41480		DIODE	JEDEC	1N4148
CR10	1	088-10-41480		DIODE	JEDEC	1N4148
CR11	1	088-10-41480		DIODE	JEDEC	1N4148
CR12	1	088-10-41480		DIODE	JEDEC	1N4148
CR13	1	088-10-41480		DIODE	JEDEC	1N4148
CR14	1	088-10-41480		DIODE	JEDEC	1N4148
R1	1	616-02-91C09		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R2	1	616-02-91C09		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J

FIRST USAGE MODEL 516

Table 6-8 (Cont'd.) 205-63-50542 1/411 SHT 2

ITEM NO.	QTY REQD	P.N. PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R3	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R4	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R5	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R6	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R7	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R8	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R9	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R10	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R11	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R12	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R13	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R14	1	616-02-91009		RES,910 OHM 5% 1/4W	ALLEN BRAD	RC07GF911J
R15	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R16	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R17	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R18	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R19	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R20	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R21	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R22	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R23	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R24	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R25	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R26	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J

FIRST USAGE MODEL 516

Table 6-8 (Cont'd.) 205-89-00548 19411 SHT 3

ITEM NO.	QTY REQD	E M R PART NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
R27	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
R28	1	616-02-75000		RES,7.5K 5% 1/4W	ALLEN BRAD	RC07GF752J
U1	1	046-18-00019		INTCKT,DECODER,1 OF 16	FCH	U6N931159X
U2	1	046-18-00019		INTCKT,DECODER,1 OF 16	FCH	U6N931159X
U3	1	046-18-00019		INTCKT,DECODER,1 OF 16	FCH	U6N931159X
U4	1	046-18-00019		INTCKT,DECODER,1 OF 16	FCH	U6N931159X
U5	1	046-18-00019		INTCKT,DECODER,1 OF 16	FCH	U6N931159X
U6	1	046-18-00019		INTCKT,DECODER,1 OF 16	FCH	U6N931159X
U7	1	046-18-00019		INTCKT,DECODER,1 OF 16	FCH	U6N931159X
U8	1	046-18-00019		INTCKT,DECODER,1 OF 16	FCH	U6N931159X
U9	1	046-97-00034		INTCKT,QUAD 2IN NAND GATE SYL/MOT		SG143-03/MC458 P OR L
U10	1	046-97-00034		INTCKT,QUAD 2IN NAND GATE SYL/MOT		SG143-03/MC458 P OR L
U11	1	046-97-00034		INTCKT,QUAD 2IN NAND GATE SYL/MOT		SG143-03/MC458 P OR L
U12	1	046-97-00033		INTCKT,QUAD 2IN NAND GATE SYL/MOT		SG142-03/MC408 P OR L
U13	1	046-97-00034		INTCKT,QUAD 2IN NAND GATE SYL/MOT		SG143-03/MC458 P OR L
U14	1	046-97-00034		INTCKT,QUAD 2IN NAND GATE SYL/MOT		SG143-03/MC458 P OR L
U15	1	046-11-00015		INTCKT,4 BIT BINARY COUNT TI /NSC		SN7493N /DM 8533N
U16	1	046-11-00015		INTCKT,4 BIT BINARY COUNT TI /NSC		SN7493N /DM 8533N
U17	1	046-97-00034		INTCKT,QUAD 2IN NAND GATE SYL/MOT		SG143-03/MC458 P OR L
U18	1	046-97-00034		INTCKT,QUAD 2IN NAND GATE SYL/MOT		SG143-03/MC458 P OR L
REF1	1	905-01-00685	19409	SCHEMATIC,PWA		
REF2	1	905-04-00001	9500	SPEC,COMPONENT SPACING		

FIRST USAGE MODEL 516

Table 6-7. Vendor List

ABBREV.	VENDOR NAME AND ADDRESS
ALCO	Alco Electronics Manufacturing Co., Lawrence, Mass.
ALLEN BRAD	Allen-Bradley Co., Milwaukee, Wis.
ALPHLEX	Alpha Wire Corp., Elizabeth, N. J.
AMATHOM	Amathom Electronic Hdwr. Co., Inc., New Rochelle, N. Y.
AMER RADION	American Radionic Co., Inc., 51 Austin, Danbury, Conn.
AMER SEALANT	American Sealants Co., Hartford, Conn.
AMPEREX	Amperex Electronic Co., Hicksville, N. Y.
AMPH BORG	Amphenol Corp., Broadview, Ill.
AMPHENOL	Amphenol Corp., Los Gatos, Calif.
AMP INC.	Amp, Inc., Harrisburg, Pa.
BECK INSTR	Beckman Instruments, Inc., Fullerton, Calif.
BECKMAN	Beckman Instruments, Inc., Fullerton, Calif.
BIRNBACH	Birnbach Radio Co., Inc., New York, N. Y.
BURNDY	Burndy Corp., Norwalk, Conn.
BOURNS	Bourns Inc., Riverside, Calif.
CARR FAST	Carr Fastener Co., Cambridge, Mass.
CHI MIN LAMP	Chicago Miniature Lamp Works, Chicago, Ill.
C & K	C & K Components, Inc., Newton, Mass.
CKT STRU	Circuit Structures Lab., Santa Ana, Calif.
CINCH	Cinch Mfg. Co., Chicago, Ill.
CLAROSTAT	Clarostat Mfg. Co., Dover, N. H.
CONTINENTAL	Continental Connector Corp., Woodside, N. Y.
CTS	CTS Corp., Elkhart, Ind.

Table 6-9 (Cont'd.). Vendor List

ABBREV.	VENDOR NAME AND ADDRESS
DALE	Dale Electronics, Inc., P.O. Box 609, Columbus, Nebraska
DEL BLINN	Delbert/Blinn Co., Pomona, Calif.
DOUG RAND	Douglas Randall, Inc., 6 Pawcatuck Ave., Westerly, R.I.
EECO	Engineered Electronics Co., Inc., Santa Ana, Calif.
E. F. JOHNSON	E. F. Johnson Co., Waseca, Minn.
ELCO	Elco Corp., Willow Grove, Pa.
ELDEMA	Eldema Corp., Compton, Calif.
EMR-C	EMR-Computer, Div. of Weston Instruments, Inc., 8001 Bloomington Freeway, Minneapolis, Minnesota
EMR-T	EMR-Telemetry, Div. of Weston Instruments, Inc., Sarasota, Florida
ERIE	Erie Technological Products, Inc., Erie, Pa.
FCH	Fairchild Camera and Instrument Corp., Mountain View, Calif.
FERROX-CUBE	Ferroxcube Corp. of America, Saugerties, Calif.
GEN CEMENT	General Cement, Div. of Textron, Inc., Rockford, Ill.
G. E.	General Electric Co., Miniature Lamp Dept., Cleveland, Ohio
GRAYHILL	Grayhill, Inc., La Orange, Ill.
HARTWELL	Hartwell Corp., Los Angeles, Calif.
HATHAWAY INS.	Hathaway Instruments, Inc., Denver, Colorado
H. H. SMITH	Herman H. Smith, Inc., Brooklyn, N. Y.
HUBBELL	Harvey Hubbel, Inc., Bridgeport, Conn.
IEE	Industrial Electronic Engineers, Inc., 7720 Lemona Ave., Van Nuys, Calif.
IERC	International Electronic Research Corp., Burbank, Calif.

Table 6-9 (Cont'd.). Vendor List

ABBREV.	VENDOR NAME AND ADDRESS
IRC	IRC, Inc., Burlington, Iowa
JEDEC	
LITTELFUSE	Littelfuse, Inc., Des Plaines, Ill.
MALLORY	Mallory Capacitor Co., 3029 E. Washington St., Indianapolis, Indiana
MIDWEC	Midwec Corp., 602 Main, Oshkosh, Nebr.
MILTON ROSS	Milton Ross Metals Co., Southampton, Pa.
MOT	Motorola Semiconductor Products, Inc., Phoenix, Ariz.
NSC	National Semiconductor Corp., Santa Clara, Calif.
PENDAR	Clare-Pendar, Inc., Post Falls, Idaho
QVL	Qualified Vendor List
RCA	Radio Corp. of America, Somerville, N. J.
RIEDON	Riedon Avionics, Inc., Van Nuys, Calif.
ROSS MFG.	Ross Mfg. Co., Cleveland, Ohio
ROTRON MFG.	Rotron Manufacturing Co., Inc., Woodstock, N. Y.
SCANBE	Scanbe Mfg. Corp., Monterey Park, Calif.
SEALECTRO	Sealectro Corp., Mamaroneck, N. Y.
SEASTROM	Seastrom Mfg. Co., Glendale, Calif.
SHAKEPROOF	Shakeproof, Div. of Illinois Tool Works, Inc., Elgin, Ill.
SIG	Signetics Corp., Sunnyvale, Calif.
SOUTHCO	South Coast Co., Newport Beach, Calif.
SPEC (EMR-T)	EMR-Telemetry, Div. of Weston Instruments, Inc., Sarasota, Florida
SPRAGUE	Sprague Electric Corp., Bristol, Conn.

Table 6-9 (Cont'd.). Vendor List

ABBREV.	VENDOR NAME AND ADDRESS
SUPERIOR	Superior Electric Co., Bristol, Conn.
SYL	Sylvania Electric Products, Inc., Semiconductor Div., Woburn, Mass.
TEPRO	Tepro of Florida, Inc., Dunedin, Florida
T. I.	Texas Instrument, Inc., Dallas, Texas
USECO	Useco, Inc., Mt. Vernon, N. Y.
WABCO	Westinghouse Air Brake Co., Signal and Communications Div., Pittsburgh, Pa.
WAKEFIELD	Wakefield Engineering, Inc., Wakefield, Mass.

Table 6-10. Model 516 Recommended Spares List

PART DESCRIPTION	EMR STOCK NO.	VENDOR NAME	VENDOR PART NO.	TQ	RS	PRICE
MODEL 516						
INTEGRATED CIRCUIT, 4 Bit Binary Count	046-11-00015	TI	SN7493N	2	1	
INTEGRATED CIRCUIT, (when stk depleted)	046-14-00006	Sylvania	SG-142-03	9	1	
INTEGRATED CIRCUIT, (when stk depleted)	046-14-00007	Sylvania	SG-143-03	13	1	
INTEGRATED CIRCUIT, Pos. Volt Regulator	046-16-00019	Motorola	MC1461R	1	1	
INTEGRATED CIRCUIT, Decoder, 1 of 16	046-18-00019	FCH	U6N931159X	8	1	
INTEGRATED CIRCUIT, Voltage Regulator	046-18-00020	FCH	U5R7723393	1	1	
INTEGRATED CIRCUIT, OPNL AMPL, 18V	046-34-00004	NAT SEMI	LM301AH	2	1	
INTEGRATED CIRCUIT, Neg. Volt Regulator	046-34-00008	NSC	LM304H	1	1	
DIODE, Zener, 9V ±5% at 7.5 ma	088-10-09390	JEDEC	1N939	1	1	
DIODE, Voltage Reg., 13V ±5%	088-10-09642	JEDEC	1N964B	1	1	
DIODE	088-10-41480	JEDEC	1N4148	18	1	
DIODE, 1N746A Zener, 3.3V	088-99-00099	Spec	642-00	1	1	
LAMP, T-1-3/4, 28V, .04A	151-02-00001	QVL	MS25237-327	1	1	
POTENTIOMETER, 2K ±5% PCB, .26 RES	201-98-00186	Bourns	3290P-1-202	1	1	
POTENTIOMETER, 500 ohm PCB, .29 RES	201-98-00189	Bourns	3290P-1-501	2	1	
POTENTIOMETER, 500 ohm ±5%, .75W	201-98-00197	CLAROSTAT	76JA-3	1	1	
POTENTIOMETER, 100 ohm ±5%, .75W	201-98-00198	CLAROSTAT	76JA-3	1	1	
RECTIFIER	214-98-00017	Motorola	MDA970-2	3	1	
TRANSISTOR	263-10-30550	JEDEC	2N3055	1	1	
TRANSISTOR, PNP, Switch/Amp, 50V	263-10-32510	MML 15	2N3251	4	1	
TRANSISTOR	263-10-37400	JEDEC	2N3740	2	1	
TRANSISTOR	263-10-37660	JEDEC	2N3766	2	1	
TRANSISTOR	263-10-39470	JEDEC	2N3947	2	1	
CAPACITOR, .1 mf ±20%, 50V LS.200	301-13-10002	Erie	8131-050-651-104M	6	1	
CAPACITOR, .005 mf +80-20%, 100V	301-70-50000	Erie	835-000 X5V0 502Z	8	1	
CAPACITOR, .22 mf ±20%, 35V	336-23-22002	Spec	601	1	1	

Table 6-10 (Cont'd.). Model 516 Recommended Spares List

PART DESCRIPTION	EMR STOCK NO.	VENDOR NAME	VENDOR PART NO.	TQ	RS	PRICE
CAPACITOR, .47 mf ±20%, 35V	336-23-47002	Spec	601	1	1	
CAPACITOR, 10 mf ±20%, 15V	337-21-10004	Spec	601	2	1	
CAPACITOR, 6.8 mf ±20%, 35V	337-23-68003	Spec	601	4	1	
CAPACITOR, 150 mf ±20%, 15V	339-21-15005	Spec	601	1	1	
CAPACITOR, 2300 mf −10+70%, 50V	354-64-23006	Sprague	39D-238-G-050-JT-4	1	1	
CAPACITOR, 1100 mf −10+70%, 50V	354-65-11006	Sprague	39D-118-G-050-HP-4	1	1	
CAPACITOR, 4000 mf −10+75%, 25V	354-70-44006	Sprague	39D-408-G-025-JS-0	1	1	
RESISTOR, 1.5 ohm ±1%, .25W	601-05-00159	Dale	RS1/4	1	1	
RESISTOR, 4.0 ohm ±1%, .25W	601-05-00409	Dale	RS1/4	1	1	
RESISTOR, 3.0 ohm ±1%, .5W	601-13-00309	Dale	RS1/2	1	1	
RESISTOR, .5 ohm ±3%, 10W, 100 ppm	601-86-00059	Dale	RS10	1	1	
RESISTOR, 0.4 ohm ±1%, .15W	602-10-00049	Dale	WWA-22	1	1	
RESISTOR, 2.830K ±.5%, .08W	656-07-28300	Riedon	SM-3	1	1	
RESISTOR, 1.82K & 2.83K ±.5%	656-99-00001	Spec	19405	1	1	

Table 6-11. Customer Provisioning Questionnaire

1.	Equipment to be spared Model No.(s):_____ Serial No.(s):_____
2.	Number of equipments to be spared in each location_____
3.	Operating time and cycle:_____hours/day,_____days/week.
4.	Operating Environment: A. Temperature:_____ B. Humidity:_____ C. Altitude:_____ D. Shock and Vibration:_____
5.	Non-operating Environment:_____ A. Temperature:_____ B. Humidity:_____ C. Altitude:_____
6.	Desired probability of being able to spare from complement _____percent for_____months.
7.	Can usage permit troubleshooting to parts level when a failure occurs?_____
8.	What spare assemblies do you have that are used in this Model Equipment?_____
9.	Do you wish us to exclude the EMR warranty period?_____

TECHNICAL MANUAL UTILITY REPORT

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